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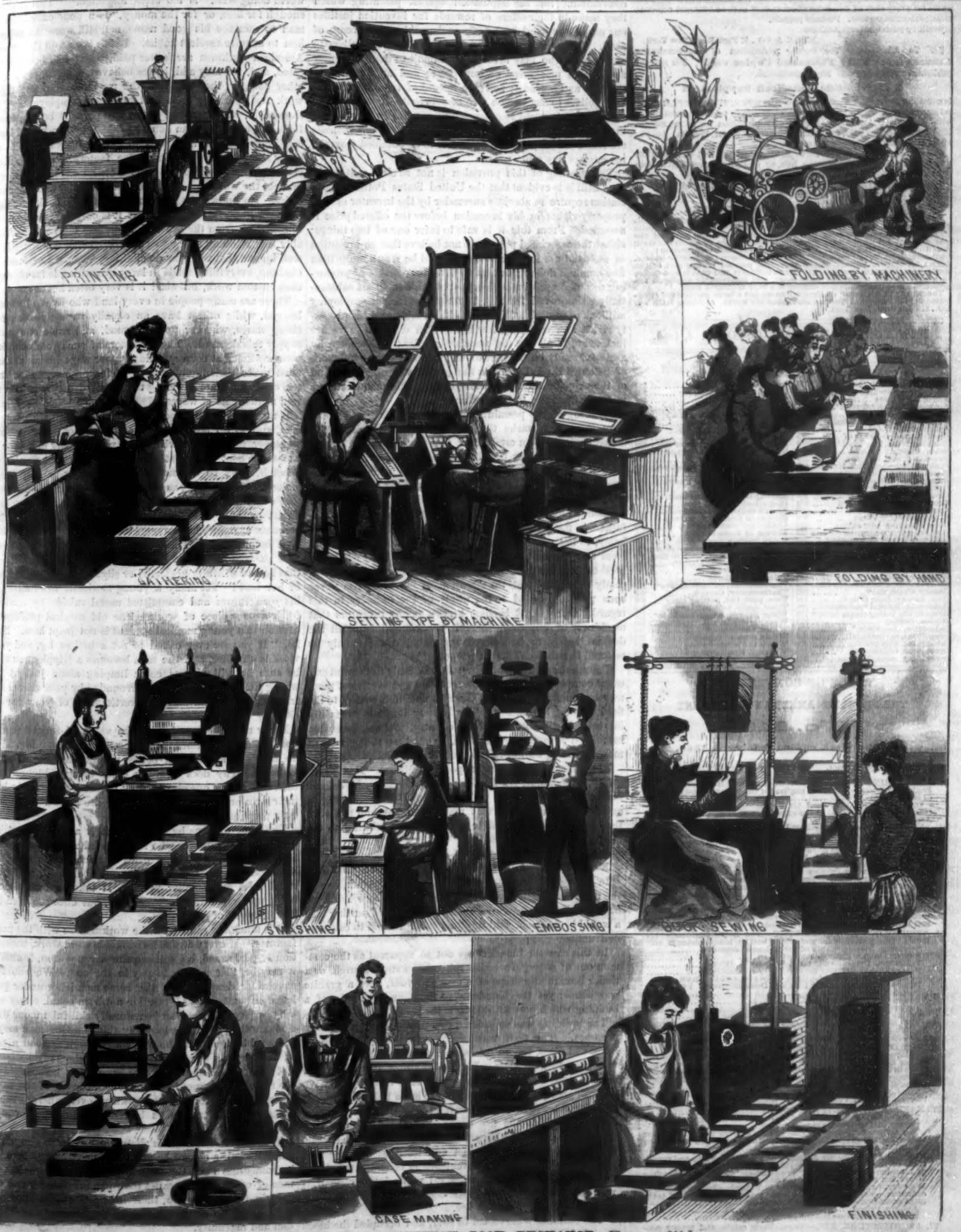

BOOK-MAKING—THE AMERICAN BOOK EXCHANGE.—[See page 211.]

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NEW YORK, SATURDAY, OCTOBER 2, 1880.

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(Illustrated articles are marked with an asterisk.)

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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 248,

For the Week ending October 2, 1880.

Price 10 cents. For sale by all newsdealers.

POTTERS' MACHINERY—AN OPENING FOR INVENTORS.

Why it is that potters are not inventors, and that the means, methods, and appliances of potters have failed to challenge the ingenuity of men not engaged in that industry, it is hard to say. The fact is manifest, however, that there is no other industry which has been so little benefited by invention during the past two hundred years. The records of the United States Patent Office show less than fifty patents connected with the manufacture of pottery, less than half the number applying to potters' machinery. That the associated potters of the United States are imperfectly aware of the need of inventors in their trade and of the possibility of inaugurating improvements in their industry, is evident from the resolution adopted by them at their recent convention. But the stipulation against patenting which they make in their offers of rewards for invention justifies our use of the word *imperfectly* in describing their sense of need. They offer (1) a reward of five hundred dollars to any person who may invent and submit to them any new and useful machinery of importance and applicability in their art and business; and (2) a reward of two hundred and fifty dollars to any person who may invent any essential and useful improvement to or upon any machinery now in use by potters, "provided that these inventions or improvements are free from all patents obtained or to be obtained from the inventor or any other person."

The meaning of this provision is not so clear as it might be. Still it is evident that the United States Potters' Association require an absolute surrender by the inventor of any property rights in his invention before the offered prize is awarded. From this it is safe to infer one of two things: either the associated potters do not believe that an invention of essential use in their industry could be worth more than five hundred dollars; or that an inventor capable of producing new and useful machinery, applicable in an art substantially unimproved for two hundred years, yet employing millions of capital, is likely to hold his labor and his property rights at a curiously low figure. In either case we are inclined to think that the association might be benefited by a careful study on the part of its members of the influence of patented inventions upon the progress of other arts, and of the value of such inventions both to the manufacturers who use them and to their patentees.

Speaking of the premiums offered, the *Pottery and Glassware Reporter* remarks that "whatever causes may be to blame for it, it is an established fact that pottery is behind the age in the matter of labor-saving machinery, the same hand processes being now employed as were in vogue thousands of years ago. While every other industry has benefited largely by the inventive genius of modern times, the potter plods on in much the same way as did his forefathers in the art. This state of affairs is largely due, probably, to the conservatism of the potters themselves, who seem very generally to go on the principle that 'what was good enough for their fathers is good enough for them,' and partly to the fact that the attention of inventors has never been publicly called to the needs of the industry in this regard. Once let it become known among inventors that machinery of improved form is needed, and from all the devices likely to be offered something can certainly be selected to suit the different purposes."

Though the anti-patent stipulation is likely to prevent any eager competition for the prizes referred to, the offer of them may be beneficial in calling the attention of inventors to the field so long left fallow. The pottery business is rapidly increasing in importance in this country, and any invention calculated to improve, facilitate, or cheapen the process of manufacturing cannot fail to become a valuable property.

The associated potters appointed Messrs. Thomas C. Smith, Greenpoint, N. Y., John Moses, Trenton, N. J., and M. Tempest, Cincinnati, Ohio, a committee to investigate and test any inventions that may be offered, and to award the prizes. To them all communications relating to the matter should be addressed.

BURNING OF A SUPPOSED FIREPROOF BUILDING.

In the recent burning of the Manhattan Market, one of the most conspicuous and costly buildings in New York, we have another illustration of the fatal mistake of putting into a would-be fireproof building just enough wood to cause its destruction.

In this case the blunder was not so apparent as the common one of setting a wooden spire over a stone church, or a tinder box, in the shape of a mansard roof, over a granite warehouse; yet the blunder was there, and the ruin of a building which cost $1,400,000 is the result.

The building was considered practically if not absolutely fireproof. The floor was of concrete, the walls were of brick and glass, the rafters were iron trusses, and the roof was covered with slate. The stall fixtures were of wood; but the stalls were so widely spaced that there would have been no great danger of injury to the main building through their burning, even when re-enforced by the pile of empty barrels in which the fire began, had the roof been constructed as it should have been in a building of that character. Unfortunately the vast and lofty arch of the roof was lined with wood for convenience in fastening the slates, and, though the quantity of wood was relatively small, it was large enough to insure the destruction of the building, otherwise fireproof against fire.

The building was erected in 1871, and occupied the block bounded by Thirty-fourth and Thirty-fifth streets, and Eleventh and Twelfth avenues. It was 800 feet long, 200 feet deep, 80 feet high in the interior, and was surmounted by a lofty clock tower. The building, with the land and foundations, cost about $2,000,000. The loss by the fire exceeded $900,000.

CONSCIENTIOUS WORKERS.

The tendency of our times is to disregard old maxims. It is true, many of them, based on the experience of other people under very different conditions, are not applicable in our day. "Haste makes waste" may be true in the workshop, but the business man knows that "time is money," and it pays to be in a hurry when the market shows signs of a change.

The good old maxim that "whatever is worth doing is worth doing well," is too often forgotten. "That is good enough for him, or for the money," is a poor excuse for a man to sacrifice his good name, and still worse to induce him to acquire careless habits. It has been said that while American workmen are better paid, better fed, better educated, and, we may add, better behaved, than those of any other country, they can beat the world in slighting their work and cheating their customers and employers. The shoemaker, who turns out one or two pairs of boots a week for a customer, takes an honest pride in his work, and feels and knows that he is to be held personally responsible for every stitch he puts in. In a large factory, where the division of labor should make every man an expert in his own branch, the workman often loses his identity and responsibility. He knows the customer cannot fall back on him, however imperfect his work. If it is only covered up so as to conceal it from the eye of his foreman he is safe. Probably this is doing much to encourage careless work. It is well known that ready-made clothing, boots, dresses, underclothing, everything made in large quantities, is far cheaper than custom work, but alas! it is very often not as good.

There are many people in every land who like to be humbugged, while others have an equally strong passion for cheap wares, whether poor or good, and some one must supply this demand. The producers of such goods employ poor workmen at correspondingly poor wages, because they must make their profits out of their workmen. Five and ten cent stores are lowering the standard of production as well as the scale of wages.

It never pays to be a poor workman. If you are a young man, aim to do honest work, and, although your present employer may not be willing to pay you any more for a well-made coat or a neatly-finished boot than he would for a botch, don't be discouraged. If you are a carpenter, make the best joint you can; if you are a machinist, see that every bolt and rivet is as firm as if your life depended on its properly fulfilling its duties. How carefully the aeronaut examines his balloon, the tight rope performer his rope before he trusts his life to it. Would a shipbuilder take passage on a vessel of his own building if he knew that he had willfully neglected or slighted any essential part of her hull? Yet many a young mechanic has destroyed his own future and committed moral suicide by sending forth a poor piece of work. The old surgical professor's caution to a young medical student is not inapt here. Said he, "If you are ever called to set a broken leg, and your work is a failure, and the man becomes a cripple, you may be sure he will always come limping along just at the wrong time, when you are surrounded by your clients and friends. He is a walking advertisement of your incapacity."

Every manufacturer knows the value of a good reputation. There are names that will sell almost anything. Why do Burt's shoes bring a better price than those of other makers? Why does Squibb's ether bring a higher price than that of any one else? Why do Merk's chemicals have their own price list? Because they are known to be honestly prepared.

The path to fame by honest merit is a slow and tedious one. A manufacturer who is so careful about his products that he has to put a higher price on them than his less conscientious neighbor can sell for, may be repaid at first by small sales and smaller profits. It takes a long time to build up a reputation by excellence, but once acquired it is like the pearl of great price.

It is much the same with the workman as with the manufacturer. If every stroke he strikes is solid work, conscientiously performed, he will acquire a reputation, limited as it may be, that is sure to pay in the end. We would not conceal or deny the fact that some men labor under peculiar disadvantages. All men are not born equal, either mentally or physically. One is naturally skillful in one direction, another is expert in many things. One man may do his level best, and yet he will not turn out as good a piece of work as his more skillful brother who only half tries. Let him not be discouraged because he is handicapped in the race, and may not be able to reach the top of the ladder. There is room for honest workmen everywhere; even respectable mediocrity pays better than brilliancy coupled with trickery.

The native American is distinguished by his ingenuity, and with half a chance he makes his mark everywhere. Yet he sometimes loses the race in competition with less able men of other lands, because their careful training and early drill in their profession, their long and severe apprenticeship, has more than compensated for the want of natural tact and ingenuity.

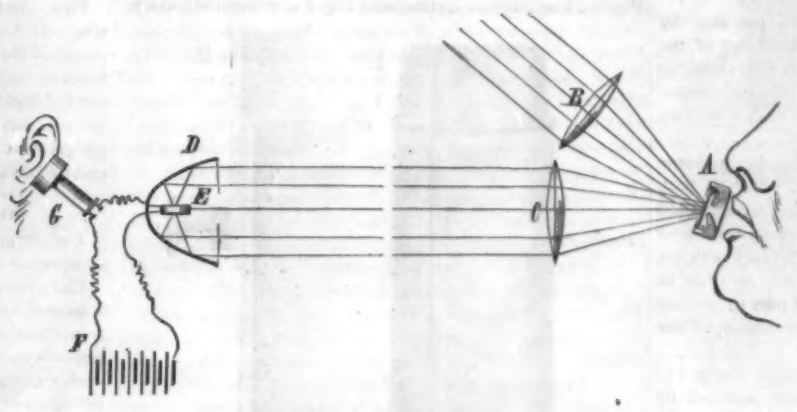
Perseverance will not conquer all things, but it goes a long way toward success. While luck seems to favor the

few, most men have to carve out their own success by hard labor, in which a full determination to do everything to the very best of one's ability counts for more than is generally supposed. Above all things, don't waste time in regretting that another trade was not chosen. If it is an honest one, stick to it and it will pay.

THE PHOTOPHONE.

As the remarkable series of investigations in relation to sound transmission by light, which led to the invention of the photophone by Professor Bell, have already been described at length in the SCIENTIFIC AMERICAN (page 176, current volume), and in the SUPPLEMENT (No. 246), only a brief reference to the fundamental principles of the invention will be needed to make clear the annexed diagram, which illustrates the manner in which articulate speech is transmitted by means of a beam of light, without any visible or tangible connection between the transmitting and receiving stations.

A beam of light from any source is concentrated on the diaphragm, A, by the lens, B, and the diaphragm, which is capable of reflecting the light, is placed in such a position in relation to the lens, B, as to project the light along a line joining the axes of the lens, C, and the parabolic reflector, D. The lens, C, renders the divergent rays of light parallel, and the parabolic reflector concentrates the light upon the selenium cell, E.



BELL'S PHOTOPHONE.

The selenium forms a part of an electrical circuit, which includes the battery, F, and receiving telephone, G. A sound made in the vicinity of the transmitting instrument vibrates the diaphragm, A, and undulates the beam of light projected through the lens, C, and the consequent variations in the intensity of the light concentrated on the selenium by the parabolic reflector changes the electrical conductivity of the selenium and renders the electric current undulatory. This current affects the receiving telephone in the same way as it would be affected in an ordinary telephonic circuit, and the sounds made in the transmitting instrument are reproduced in the telephone.

We have described but a single form of apparatus, as the principle is substantially the same in all the forms made known to the public. Professor Bell, in his recent lecture before the American Society for the Advancement of Science, said that about fifty different forms of apparatus had been devised. The distance through which the "photophone" will work successfully has not yet been determined, but it is believed that the extreme will be limited only by the difficulty of adjusting the instruments at widely separated stations.

In the course of his experiments with a perforated disk interrupter, Professor Bell sought to ascertain the nature of the rays that affect selenium. For this purpose he placed in the path of an intermittent beam various absorbing substances. When a solution of alum, or bisulphide of carbon, is employed, the loudness of the sound produced by the intermittent beam is very slightly diminished; but a solution of iodine in bisulphide of carbon cuts off most, but not all, of the audible effect. Even an apparently opaque sheet of hard rubber does not entirely do this. When the sheet of hard rubber was held near the disk interrupter, the rotation of the disk interrupted what was then an invisible beam, which passed over a space of about twelve feet before it reached the lens which finally concentrated it upon the selenium cell. A faint but perfectly perceptible musical tone was heard from the telephone connected with the selenium. This could be interrupted at will by placing the hand in the path of the invisible beam. It would be premature, says Professor Bell, without further experiments, to speculate too much concerning the nature of these invisible rays; but it is difficult to believe that they can be bent rays, as the effect is produced through two sheets of hard rubber containing between them a saturated solution of alum. Although effects are produced as above shown by forms of radiant energy which are invisible, the apparatus for the production and reproduction of sound in this way has been named the "*photophone*," because an ordinary beam of light contains the rays which are operative.

Arrival Home of the Anthracite.

The little steamer Anthracite, worked on the Perkins high pressure system, arrived at Falmouth, England, on the 14th of September, having made the voyage from Philadelphia in twenty-three days. She had on board at starting twenty-five tons of coal. Having thus twice crossed the Atlantic successfully, this vessel seems to have well demonstrated the practical value of the new system. The reports of the machinery trials of this steamer, which took place a few weeks ago at the United States Navy Yard, Brooklyn, have not yet been made public.

Phosphorescent Lighting.

Dr. Phipson takes sulphide of barium, or some other substance which is rendered phosphorescent by the solar rays, and incloses it in a Geissler tube, through which he passes a constant electric current of a feeble but regular intensity. He claims to obtain in this manner a uniform and agreeable light, at a cost lower than that of gas.—*Les Mondes.*

THE SOCIAL SCIENCE ASSOCIATION.

The annual meeting of the American Social Science Association began in Saratoga, N. Y., Sept. 8. The papers read related chiefly to education and sanitary affairs. The report of the Committee on Casualties in Mining, read by Mr. J. D. Weeks, of Pittsburg, showed that "in Pennsylvania, one man was killed last year for each 105,700 tons of anthracite raised, a greater mortality than obtained in English mines. In Ohio the figures, confessedly imperfect, give one death to 142,253 tons of coal raised in 1874, and in 1878, one death to 255,000 tons raised. While some accidents are unavoidable, there is no doubt that a great majority of explosions come from the carelessness of miners, who will not hesitate to open a safety-lamp surrounded by fire damp to light a pipe. The peril from the falling of roofing and slate is greater, however, than any other, being about 40 per cent. of the total; and of these the public hears the least because they are so common. These are too often the result of forgetfulness, rashness, or neglect. And again, employes are more at fault than employers. In fact, carelessness and neglect are common among miners to a degree which seems scarcely possible.

A report on Kindergarten schools by W. T. Harris, of St. Louis, recognized very clearly the advantages of positive, playful, and social training for children, and as clearly the defects and dangers of the Kindergarten system as developed by Froebel and carried out in this country. The characteristic differences between American and German children, from geographical and social causes, were well insisted upon, but no reference was made to the narrow range and purely artificial cast of Froebel's mind as exemplified in the matter and method of his teaching. His spirit was true and admirable, but his system rigidly applied is anything but suitable for American children.

Education in England, particularly as developed for girls and women, was treated by Miss E. J. Simcox, of the London School Board, and the co-education of the sexes was afterward discussed with some feeling. Another aspect of education was considered by President J. M. Gregory, of the Illinois State University, in a paper on American newspapers. Mr. Gregory took a generous and hopeful view of the influence of newspapers, regarding them as the best index of American life and the fairest representation of the people. The best brain of the country speaks through the newspapers. They are the people's libraries—the cyclopedia of the millions.

The sanitary renovation and salvation of Memphis was discussed by Dr. A. F. Lincoln, of the National Board of Health. The regulation of medical practice by statute law was considered by Dr. E. W. Cushing, of Boston; and the economic aspects of the treatment of the insane, by Dr. Walter Channing, of the same city.

The question of adulteration of foods, medicines, etc., was brought prominently before the meeting by Mr. George T. Angell, whose sweeping assertions were disputed by Professor S. W. Johnson, of New Haven, Professor Remsen, of Baltimore, Professor Nichols, of Boston, and others. Secretary Sanborn, on the contrary, stood up for Mr. Angell, rating the negative testimony of those who had not been able to discover many or frequent adulterations as of less weight than that of men who had found such adulterations.

The proceedings of the second day's meeting embraced the reading of the following papers: "The Socialist Laws of Germany," by H. W. Farnham; "Modern Legislation Touching Marital Rights," by Henry Hitchcock; "Libel and its Legal Remedy," by E. L. Godkin; "Pensions in a Republic," by F. J. Kingsbury; "Laws Regarding Dissection and Grave Robbery," by Edward M. Hartwell; and "Indeterminate Sentences for Crime," by Z. R. Brockway, Superintendent of the Elmira Reformatory.

In the first paper and the third and last day, Rev. D. O. Kellogg read a paper on "The Principle and Advantage of Association in Charities." In the subsequent discussion Robert T. Paine maintained that charity must do four things—relieve worthy need promptly, fittingly, and tenderly; prevent unwise alms to the unworthy; raise into independence every needy person, where this is possible, and make sure that no children grow up to be paupers. Relief, detection, elevation, and prevention are all essential parts of a complete plan. Families or persons who have fallen into want usually need, first, relief—food if hungry, fuel if cold, clothing if naked; second, a long, steady, patient pull by a wise, strong hand up into solid land. This is the work in which the associated charities ask cordial co-operation. Almsgiving, which saps manhood, self-respect, and self-reliance, is a curse. "The Care and Saving of Neglected Children" was considered by Miss Hollowell, and the "Volunteer System of Charity," by Mrs. F. B. Lockwood. Mr. G. B. Bartlett submitted a paper on "The Recreations of the People," in which he attributed most of the recent improvement in the physical health and strength of our people to the increase in holidays and the attention given to athletic sports. Mrs. Julia Ward Howe contributed a paper on "The Changes in American Society;" and Frederick Law Olmstead one on "Public Parks," in which he called attention to the fact that twenty-five years ago we had no parks which might not better have been called something else than a park, whether so designated or not. Since then a class of works so-called has been undertaken which to begin with are at least spacious and have possibilities of parklike qualities. On twenty of these now in progress over $40,000,000 have been expended—well nigh $50,000,000—and this does not tell the whole cost. Considering that in the towns making this outlay the necessity of a park was little felt, it manifests a remarkable progress of public demand. While in the first half of the century only one public park was laid out in Europe, since 1850 as many parks have been laid out in the large towns of Europe as with us, and the area has been larger there. What has been secured for London alone is of greater extent than all the town parks of America together. The next meeting of the Association will be held in Saratoga in September, 1881. The officers for the year are:

President—Francis Wayland, Yale College.

Vice Presidents—Benjamin Pierce, Cambridge, Mass.; Theodore D. Wolsey, New Haven; Martin B. Anderson, Rochester; Mrs. Caroline H. Dall, District of Columbia; Thomas C. Amory, Boston; Henry B. Baker, Lansing, Mich.; Thomas M. Post, St. Louis; J. W. Hoyt, Cheyenne; Rufus King, Cincinnati; W. H. Ruffner, Richmond; W. L. Trenholm, Charleston; Isaac Sherman, New York; Henry Villard, New York; Maria Mitchell, Poughkeepsie; Nathan Allen, Lowell; Mrs. J. E. Lodge, Boston.

General Secretary—F. B. Sanborn, Concord.

Treasurer—F. J. Kingsbury, Watertown, Conn.

Directors—Dorman B. Eaton, New York; T. W. Higginson, Cambridge; Horace White, New York; J. W. Dickinson, Newton, Mass.; Anson P. Stokes, New York; Jonas M. Libby, New York; Carroll D. Wright, Boston; G. J. Riche, Philadelphia.

Department of Education—W. T. Harris, Concord, Mass., chairman; Emily Tarbott, Boston, secretary.

Health Department—D. F. Lincoln, Boston, chairman; E. W. Cushing, Boston, secretary.

Finance Department—David A. Wells, Connecticut, chairman; Hamilton A. Hill, Boston, secretary.

Department of Social Economy—W. B. Rogers, Boston, chairman; Walter Channing, Boston, secretary.

Department of Jurisprudence—Francis Wayland, New Haven, chairman; Theodore J. Woolsey, New Haven, secretary; corresponding members, Moncure D. Conway and Edith Simcox, England.

The Course of a Lightning Flash.

Prof. Tait, of Edinburgh, insists that when people think they see a lightning flash go upward or downward they must be mistaken. The duration of a lightning flash is less than the millionth part of a second, and the eye cannot possibly follow movements of such extraordinary rapidity. The origin of the mistake seems, he says, to be a subjective one, viz., that the central parts of the retina are more sensitive, by practice, than the rest, and therefore that the portion of the flash which is seen directly affects the brain sooner than the rest. Hence a spectator looking toward either end of a flash very naturally fancies that end to be its starting point.

Shades for Electric Lights.

A French inventor, M. Clémandot, has devised a shade for reducing the glare of electric lights, which he claims to be much more economical than ground glass globes. He makes his lantern of glass tubes filled with finely spun glass threads or glass wool. By reflection from the glass threads the light is given the desired diffusion, with a loss of illuminating power not exceeding 15 per cent, against 30 or 40 per cent with opal or ground glass. The natural blueness of the electric light can be corrected by tinting the glass tubes or the inclosed wool.

Loss of Melbourne Exhibits.

By the wreck of the ship Eric the Red, on the southwest coast of Australia, 150 cases of goods for the American exhibit at the Melbourne World's Fair were lost. As the Exhibition opens October 1, the exhibits cannot be replaced.

THE locomotive of the train that was wrecked in the Tay Bridge disaster has been fished up and repaired, and is now drawing trains on the Edinburgh and Glasgow line.

NEW INVENTIONS.

An improvement in fireproof ceilings has been patented by Mr. John D. Ottiwell, of New York City. The object of this invention is to prevent the plastering applied to the ceilings at the points where the corrugated arched plates meet the girders from becoming loosened and falling off.

A shoe nail for the channels of boots or shoes roughened on its shanks, having a body slightly tapered on two of its opposite sides, but drawn from the middle of the other two opposite sides to form an entering point, and provided with an elongated or diamond-shaped head, has been patented by Mr. John Hyslop, Jr., of Abington, Mass.

Mr. Julius Austin, of Wakeman, Ohio, has patented a simple, inexpensive, and effective wind wheel, to be operated by the wind for actuating pumping, grinding, and other machinery.

An improvement in refrigerators has been patented by Mr. Charles P. Jackson, of Chicago, Ill. The object of the invention is to secure economy and convenience in shipping and storing refrigerators, and to secure a constant circulation of air and an extended refrigerating or cooling surface within them.

Mr. Charles L. Norton, of New York City, has patented an improved spring clip for indexing books, which is both simple and convenient. It consists in a clip of spring metal with sides of unequal length, and having a sharp bend near the end, and an index letter stamped on the part between the bend and the end of the clip, so that the clip can be placed on the end of a page with the lettered part projecting outward, and thus indicating the index divisions of the book.

An improved neck yoke, for connection with the end of the tongue or pole in a double team, has been patented by Mr. Thomas N. Rudgers, of Fowler, Mich. It consists in the peculiar means for increasing or diminishing the leverage of the neck yoke, or adapting it to unequally matched horses.

Mr. Alfred Nobel, of Paris, France, has patented a primer for the ordinary composition of powder when reduced to meal, and thereby adapted to increase the charge in a hole of given size by its compressibility.

A fence, so constructed that it can be readily set up, and which is light, strong, and durable, and not liable to be blown down or pushed out of place, has been patented by Mr. Daniel T. Hazen, of East Milan, Mich.

A register for registering the number of fares deposited in the fare boxes used in street railway cars, stages, and for other purposes, has been patented by Mr. Joseph N. Hardy, of New Orleans, La. The invention consists of a toothed cylinder pivoted in the lower part of the fare box below the tilting trap. The shaft of this toothed cylinder is connected with an index on a circular dial, so that as the cylinder revolves it turns the index, which shows on the dial the number of fares paid.

Mr. Bernhard von Schenk, of Heidelberg, Germany, has patented a mass for manufacturing plastic objects, consisting of sulphate of lime nine and a half parts, coal or coke one part, and iron shales sixty-hundredths of a part.

Mr. William Wilmington, of Toledo, O., has patented certain improvements in that class of car wheel chills which have in the outer portion of the flange face a peripheral receptacle for sand or its equivalent. The invention consists in constructing the chill with this peripheral receptacle, and also with a circular chamber in rear of it having an inlet and outlet for the circulation of superheated steam, the object of which is to retard the cooling of the iron in order to increase the depth of the chill.

IMPROVED BLACKING BRUSH.

The engraving represents a novel blacking brush recently patented by Mr. E. L. Wood, and now being introduced by Messrs. E. L. Wood & Co., of Eastland City, Eastland county, Texas. The improvement consists in hinging the dauber or small circular brush by means of which the moist blacking is applied, so that it may swing over and become charged with the blacking contained in an ordinary blacking box clamped on the back of the polishing brush. The blacking box is secured in its place by a thumbscrew. The dauber is pivoted and provided with a crank at the back of its support so that when it is inverted so as to touch the blacking it may be rotated. Spring catches are provided which hold the dauber in either of its positions.

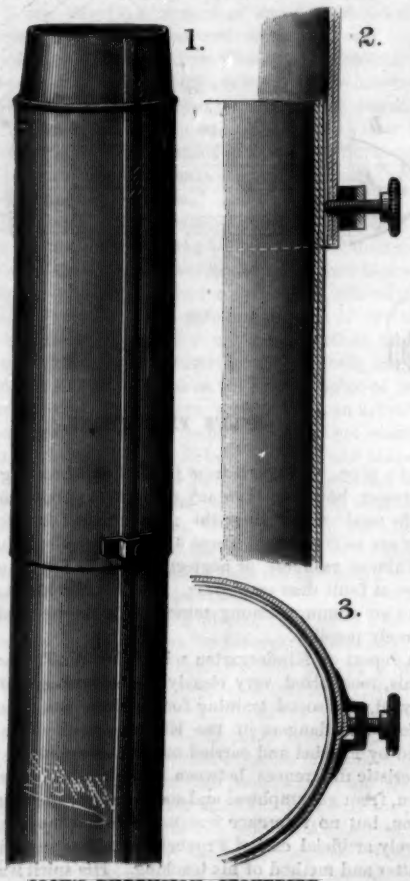
When the brush is not in use the cover is placed on the blacking box and the dauber is brought down upon it. Arranged in this way the brush may be carried without blacking other articles with which it may be brought into contact.

Importing Oysters.

Boston flats have recently been stocked with oysters unintentionally introduced from African waters by the bark Fantee. While the bark was off the coast of Africa her sides and bottom were fastened upon by oyster spat, which throve abundantly. Many bushels were removed on her recent arrival at Long Wharf and planted on the flats. It is hardly probable that they will survive the cold of the coming winter.

NEW EXTENSION STOVEPIPE.

The engraving represents an improved extension stovepipe joint recently patented by Henry Cook, corner of Main and Harrison streets, Leadville, Col. The two parts are adapted to slide together telescopically, admitting of using the pipe in situations where joints of the regular length would not be available. The advantage of this arrangement will be apparent to any one having anything to do with stoves and stovepipes, and the amount of vexation that will be avoided by its use is considerable. The construction of the extension joint will be understood by reference to the engraving, in which Fig. 1 is a perspective view of the joint, Fig. 2 a longitudinal section, and Fig. 3 a transverse section.



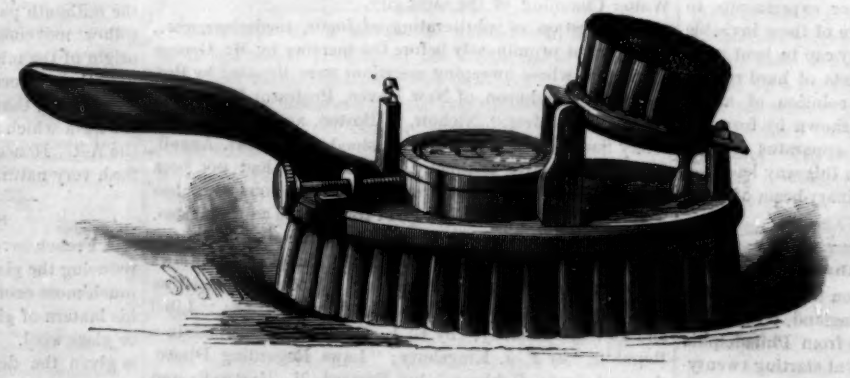
COOK'S EXTENSION STOVEPIPE.

The invention consists in a joint of stovepipe made in two parts, one sliding within the other. A thumbscrew passes through a yoke attached to the outer part, and enters any one of several indentations in the rib or seam of the other part. It will be seen that this length may be used in the same way as other pipe, and it may be readily lengthened or shortened to suit circumstances.

Further information may be obtained by addressing the inventor as above.

Solar Boiler.

In a note before the Academy of Science, in Paris, Mr. A. Pifre describes a compound reflector having a focal length much less than usual. The zone of maximum heat is nearest to the lower part of the boiler, and the laws of the heating can be easily studied. The reflector presents a usable surface of about 100 square feet to the sun. The boiler contains 1·8 cubic feet of water. When the sky is clear the water boils in about 40 minutes, and the pressure rises 1 atmosphere every 7 or 8 minutes. In several experiments even 6 minutes have been sufficient to raise the pressure 1 atmosphere. The machine connected with the apparatus has a new construction, and a pump connected with it lifted per minute 8⅓ square feet of water to a height of 10 feet. This labor is ten times as great as that previously obtained at Algiers.



NOVEL BLACKING BRUSH.

Roman Coins at Harvard.

In 1877, Robert Noxon Toppan (1858), of New York, presented to the library a collection of Roman coins, eighty-one in number, illustrating the period from 400 B.C. to Constantine the Great, A.D. 337. The coins, says the *Harvard Register*, are of copper, silver, and gold, and are of exceptional value, owing to their fine state of preservation, many of them being as clear cut as the recent coinage of the United States Mint. Copper money was first coined in Rome about 425 B.C., and this collection includes a large copper *as* of 400 B.C. The stamp of the government did not determine the value of the coin; it simply certified that the value existed in the coin. All the Roman emperors before Constantine are represented here. Cleopatra, Julius Cæsar, Brutus, Sylla, the Calpurnian, Æmilian, and Acilian families, contribute a coin each, and there are ten of the year 269 B.C.

This collection remained unarranged until quite recently, when the donor presented a handsome case, and personally arranged the coins chronologically, with a descriptive label beneath each coin. The case is of polished rosewood, two feet in height, three feet in length, eighteen inches in depth at the base, and six inches at the top. It has been placed in the art room, which is immediately above the delivery room, and can be seen at any time by permission of the librarian.

How Diamond Mines are Worked.

The system of working the diamond mines is described by an operator as follows:

The ground being picked loose by natives and broken up, is hauled out of the mines in tubs running on inclined wires; from these tubs it is transferred to a sifting cylinder, which removes the coarser stones, the remaining soil being mixed with water and slowly stirred in a flat pan of circular form, by means of arms fitted with teeth, this pan varying from 6 to 15 feet in diameter, according to the amount of work to be done. The effect of this is to leave the diamonds, which are heaviest, at the bottom; the lighter soil escaping over the edge of the pan, to be taken up by a dredger and trucked away. At the end of a day's work the contents of the circular pan are cleaned out and washed up in hand-sieves, when in turning over the sieve on the table the diamonds can be at once seen from their brilliance, some being of most perfect octahedron shape and as clear as crystal.

The rough diamonds are almost invariably below 10 carats in weight, the average being about the size of a pea; indeed, in the Bultfontein mine, a 10 carat stone is looked upon as a curiosity, though specimens exceeding 100 carats in weight have on rare occasions been secured. The value of a stone depends entirely on its color, shape, and freedom from spots or flaws; those of faultless shape and perfect whiteness taking the precedence of all others. The diamonds exceeding 20 carats in weight are mostly of various shades of yellow, a large white diamond being a comparative rarity.

A Good Example.

A shipbuilding firm of Dumbarton, Scotland, offers awards ranging between $10 and $50, to any workman in their employment who has (1) invented or introduced a new machine or hand tool into the yard; (2) improved any existing machine or hand tool; (3) applied any existing machine or hand tool to a new class of work; (4) discovered or introduced any new method of carrying on or arranging work; or (5) made any change by which the work of the yard is rendered either superior in quality or more economical in cost.

Into the Bonanza Group.

The north header of the Sutro Tunnel has passed through the Consolidated Virginia and California mines, and is fast nearing the point where it will connect with the Ophir, being at present in the Golden Gate ground, which adjoins the Ophir and Mexican on the east. The course of the tunnel will continue a little east of north until it connects with the Ophir, when it will bear more to the eastward for a connection with the Union shaft, thus passing diagonally through the Golden Gate ground at a depth of 1,600 feet below the surface. Its connection with the Union shaft will be a very important one and anxiously looked for, as it will be of invaluable assistance in the way of drainage to the new bonanza deposits now being developed in the Sierra Nevada and Union ground.

It is easy to see that the Golden Gate, located in the very midst of these valuable developments, and with the Sutro Tunnel now making its way directly through it, is rather of an interesting piece of property at the present time, as the tunnel has over a thousand feet yet to go in order to reach the Union shaft, and all the way through the Golden Gate ground, passing directly beneath the heavy and prominent croppings in the cemetery, just north of Virginia. The Golden Gate Company, formerly the old Vermont Consolidated, have their title fully perfected and covered by United States patent. They now propose to resume sinking their large new three-compartment working shaft down to a connection with the tunnel, and have levied an assessment for that purpose. They have excellent prospects already, but are going after their full share of the good things at that point.—*Enterprise.*

AMERICAN INDUSTRIES.—No. 56.

BOOK-MAKING—THE AMERICAN BOOK EXCHANGE.

Most people have heard the story, in one way or another, of the old lady who dropped into a bookstore one morning to have her old Bible reprinted, as she was advancing in years and wanted to get one in which the type was larger; how the obliging clerk took her order, and in the afternoon of the same day furnished her with a book having just the size of print and description of binding she required, and with which she was delighted as a faithful reproduction of

her cherished volume. Probably there are not many at this day who believe that books are made *de novo* with such expedition; but the business of modern publishing houses requires the help of so many essentially different industries, and the division of labor is so carried into a hundred details, that comparatively few, except those who have made a specialty thereof, have any adequate idea of the several processes and the number of different hands which the work goes through in making a printed book. We have, therefore, taken as the subject of our industrial sketch this week the leading departments of this business, as carried on by the "American Book Exchange," the style of a company which has, within less than two years, become one of the largest publishers of standard books in the United States.

The business was inaugurated by the publication of one volume in January, 1879. It was started on the idea that the demand for standard books would be practically almost unlimited, if their price could be so reduced as to bring them within the reach of the masses. To be able to make large reductions in the price, it was imperative that extraordinary editions should be printed, as well as that their manufacture should be conducted according to the strictest business principles. Of a great proportion of the books printed such small editions are usually sold that the expense of the preparation of the plates, with even a moderate margin of profit to the publisher, makes the proportionate cost of each volume very high as compared with what it would be were the books sold by the hundred thousand. Starting with these facts, and with the determination to issue only such books as would be universally acknowledged as standard, the originators of this enterprise have already achieved a success so decided that, in looking over the work they are now doing, it seems no exaggeration when they claim to have effected a

"literary revolution," for, although the business has been so recently established, they are now actually printing and selling over 5,000 books a day, nearly all of them being works such as no well selected library would be without, and the selling price being from one-fourth to one-tenth only of what the same books could previously have been bought for.

The initial work in the making of a book, after the "copy" is ready, is the composing or arranging of the types. This, in all books which do not contain elaborate engravings, or of which only small editions are printed, constitutes a main portion of the cost of manufacture. It is a branch of the business, however, in which it has been found very difficult to reduce the expense, as, notwithstanding all the efforts made by inventors in different parts of the world for more than fifty years past to perfect a machine for type-setting, it is only within a brief period that a successful working machine has been contrived, which, on plain work, will do the composition of a book at a lower price than the same can be done by hand. Such a machine, an illustration of which occupies the central position on the first page, has been at work in the "Gray" printing office, in New York, for two years past, and a great deal of the composition required by the American Book Exchange has been done thereon. There are twenty of these machines in this establishment, and the cost of type-setting thereby is reduced nearly 50 per cent as compared with hand work. The machines are only suitable for plain work, such as history, biography, travels, etc., where but one kind of type is used throughout, and the text is free from italics, quotations from foreign languages, tables of figures, etc. The type is compactly held in three different metallic cases, with separate grooves for the supply of each letter, the letters all lying in the same position. These cases are at the top of the machine, and the operator sits in front of a keyboard just below; a touch on any one of the keys releases the particular letter or character desired, the bottom one in its special compartment of the case, when it drops by its own gravity into a channel that conducts it to its proper position in the matter being composed. The types are thus set up in one long line, which is steadily pushed out to the left of the operator, where a "justifier" with a measure cuts it off in lengths sufficient to make lines of the width of the page of a book or newspaper column, as may be desired.

The distribution of the type, or putting them back in regular order in the cases after the printing has been done or a plate made, is performed by a separate machine, which works automatically and very rapidly, needing only a boy to tend

it. Each different letter or character has one or more nicks on the body of the type, so arranged as to be unlike the nicks on any other letter, and the distributing machine places each type in its proper place according to these nicks. An expert operator with one of these machines can compose from 45,000 to 55,000 ems of type in a day of ten hours, while good compositors will hardly average the composition and distribution of 7,000 ems each in the same time. Including the justification and distribution, the extra correction which a machine calls for, and the occasional attention of a machinist, the cost of composition comes to something less than 20 cents per 1,000 ems.

There will always, however, be a great amount of work which, from the variety of characters employed, or the style of the text, must be done by hand, and the "Library of Universal Knowledge," now in course of publication, is of this description. It will be a verbatim reprint of the latest London edition of "Chambers's Encyclopædia," with additions by American editors, covering some 15,000 separate topics, making one of the largest works of this class ever issued. It will make fifteen volumes, octavo, of nearly 1,000 pages each, closely printed type. Two volumes are to be issued monthly, S. W. Green's Son, a Beekman street printer, having contracted to do the composition of seventy pages a day regularly—an amount of work of this character which but few of our large printing offices would undertake to accomplish.

It is very rare that a book is now printed directly from the types, but a mould is taken from the type form, from which a plate is made to print from. An illustration on this page shows a large press in which the type form is placed to make this mould, the face of the type being carefully brushed with black lead, and the impression being made in wax, which is spread about a sixteenth of an inch thick on a metal backing. This wax mould is suspended in a solution of sulphate of copper, sulphuric acid, and water, and connection being made with an electric machine, the copper is deposited in the mould to represent exactly the impression left in the type by the wax, the finest lines of the most delicate engraving being clearly and sharply brought out. It takes about three hours' time for the deposit of sufficient copper to make a plate which will wear well, and when this is accomplished type metal is cast upon the back of the thin sheet of copper to form a solid backing. The plates are now carefully planed down on their backs to a uniform regular thickness, trimmed on the edges, and, where the letterpress would show a good deal of white paper in printing, some of the extra metal is cut or "routed" out. The electrotyping for these publica-

tions is done at the establishment of Lovejoy & Son, who have for several years made the electrotype plates from which the SCIENTIFIC AMERICAN is printed.

The types being set and the plates made, the form is now ready to "go to press," as printers term it, and one of the illustrations at the top of the first page represents the printing process. The work of the Book Exchange has so quickly grown to such great dimensions that it has been difficult to engage a sufficient number of the kind of presses desired to do the work. The Adams press does the greater part of the printing, over fifty presses being kept constantly at work, and fifteen of these working through twenty-four hours a day. The Adams press is an old style book press, which does not work quite as rapidly as some presses of more recent design, but it has a thorough ink distribution, gives a firm, clear, and even impression, and has always been a favorite with printers for work which was to be done with great care. There are other presses which it is claimed will do as good printing, but it is not pretended that any of them will do better book work than the Adams press.

The sheets are now ready for binding, leading details of which are represented in the other illustrations on the first page. The printing is usually done in large forms, with 16, 24, 32, 36, or 48 pages on one side of a sheet, each sheet being styled a signature, and so marked at the bottom of the first page of such signature, that, when the binder places the signatures in consecutive order, the pages of the book will all come in their proper places. The binding is all done in establishments expressly fitted up for this purpose at 18 Spruce street, 26 Beekman street, 33 and 35 Vesey street, and 8 Church street, where also are the packing and shipping departments of the business. Representations of these several buildings will be found on this page. More than 5,000 books

are now being bound daily in cloth and half Russia at these binderies, and new machinery is being put in, which, with the additional help that can be employed, is intended to double this capacity. The number of hands now engaged in this department averages 75 men and 140 women and girls.

The folding of some of the work is done by hand, while a large portion is done on folding machines, of which there

are six in constant operation. The machine will fold the sheets about as fast as a feeder can supply them. The sheet is laid by points, so that the printed matter in each page will come in just the same relative position with that in all the other pages, when a long, light strip of metal, held by curved arms, comes down and forces it through a narrow opening in the table-like top of the machine, whence it is taken through a series of tapes and rollers arranged so as to give just the folds required.

After the folding comes the "gathering," or the putting together of the different sheets which make a book. The manner in which this is done will be readily understood from the illustration, in which the employee is seen surrounded by piles of sheets, taking one from each pile successively until all the signatures of a book are held together in the hand.

As may be supposed, in the rapidity with which the folding and gathering are performed the sheets are not pressed firmly and solidly together as they appear in a bound book but to effect this they are put in a powerful press, called the "smasher," which instantly squeezes them so tight that the book will then be almost as hard as a board, and only an outside leaf or so in a pile of several thousand will be loose. In this state they are taken to a machine where two or three or more shallow cuts are sawed across the backs, just sufficient to allow room for a strong cord to pass through.

In the sewing, the books as gathered are placed in piles from 12 to 18 inches high, and these cords are arranged on frames at such distances that they will pass through the cuts sawed in the backs of the sheets. The cords are kept taut by screws in the frames, and each sheet is sewed around these cords, but so that the whole pile of books sewed around the cords may be worked along, to allow of little ends of cord being left on each side, when the string of books, as it might be called, is cut apart. These ends are made firm with glue in the cover or casing, when that is put on, and glue entirely over the back also holds the cords in their places. After the sewing the edges have to be trimmed in a cutter, of which there are several styles, then the back is rounded by a machine, the volume being held in a sort of vise, which will yet allow the signatures to be slightly moved, when a roller moving in a circle is passed forward and back over the back of the volume. The old style of doing this work was by pounding the edges with a mallet, but the machine has entirely superseded this class of work.

The dexterity with which experienced hands can put together book covers cannot fail to be surprising to one witnessing the operation for the first time. A particular kind of thin muslin, made for the purpose, and furnished in as many different shades as there are styles of dress prints in a season, is the staple article for all "cloth" bindings. It is cut enough larger than the two sides and back of a book to allow room to fold the edges well over, but the pasteboard it is intended to cover is cut out, generally by a machine, of the desired shape and size. A workman will lay out a dozen of these muslin pieces for covers, brush them thoroughly with glue, place the pasteboard for the sides in position, put in a piece of thick paper or cardboard to stiffen the back, deftly fold over all the edges, and pass the whole pile through a press, almost before an observer comprehends what he is doing.

When the edges of a book are to be gilded this part of the work is done after the trimming, a great number of books being held tightly in a press, when the edges, which are trimmed so evenly and held so closely that they present a smooth surface, are brushed over with a thin sizing, made principally of isinglass glue, and the gold leaf is laid on and burnished with a hot iron. The stamping, or lettering on the covers in gold, is done very much after the same principle, the gold leaf being pressed in by a heated stamp. The embossing, by which the various designs of cloth covers are made, either plain or with ink impressed in the design, is done in a powerful press, especially built for this purpose, from metal patterns cut in a great variety of styles. After this the book is ready for the finisher, who puts on its case or cover, making the inside of the cover to match the fly leaf at the front and back, putting in a beaded or corded trimming around the back at top and bottom if desired, and remedying any imperfections which may have been allowed to pass in other portions of the work.

We have thus followed the book through, from the time the copy is put in the printer's hands until the volumes are ready to go to the shelves of the bookseller, but our notice would be incomplete without reference to the work done by what is called the "process" system of engraving. There are several patented methods of doing this work, and it is a distinct branch of business which has grown up entirely within the past fifteen years. By these processes a photograph is made of what is to be reproduced, from either a woodcut, a steel or copper engraving, a lithograph, a pen and ink drawing, or a page of printed matter. In this manner the publishers are now reproducing by photo-electrotypes the plates of Young's "Bible Concordance," a very elaborate work, in which, interspersed through the English text, are numerous quotations from the Greek, Hebrew, and Arabic, making a book which would prove a very difficult work for the most skillful compositor or the most accomplished proof-reader. In this way, however, the pages are simply put before a camera, when a negative is taken by which an exact impression is made through a thin film of wax, when all the other parts are eaten away by acids, leaving the clear representation of the picture or print photographed in relief with an accuracy which can only be secured by such process. From this wax mould electrotypes are made in the same way as from a type form.

A great proportion of the books first issued by the American Book Exchange were such as have long been the common property of mankind, irrespective of any author's copyright property, such as the works of Macaulay, Gibbon, Milton, Goldsmith, the ancient classics, etc., besides others, which, in the absence of any copyright treaties with other countries, all American publishers are at liberty to reprint. On several of their works, however, they pay a copyright to authors, and, from the great number of copies sold of every work they take up, a small percentage on each not only makes the author's remuneration considerable, but affords him the further gratification, of infinitely greater worth to most authors, of knowing that his efforts are appreciated by the reading public. Beyond this, however, the publishers have a special editorial corps of their own, including the names of authors who have for years enjoyed a high literary reputation, and their expenses in this department alone now amount to about $20,000 a year.

No mere statement, however, covering the details of this extended industry can give a correct comprehension of the value of the work to the general public which is thus being accomplished. A library of the best description is, by this system of publishing, made to cost so little that there are but few mechanics and laboring men in the country who cannot, if they will, become the possessors of the works of some of the greatest authors who ever lived. As a factor in the education of the rising generation its influence will be widely felt, for, of the 5,000 standard books a day now being sold at these low prices, it is safe to say that only a very small proportion would be taken at the prices which such works have heretofore cost. They now go to the masses, to people who buy because they want to read them, and not to use them to fill up so many square feet of wall space in a library, and the rapidity with which the demand is increasing affords the best possible evidence that the American Book Exchange is meeting an acknowledged want of the reading community.

The details of the business in every department are under the personal management of Mr. John B. Alden, Manager, in the Tribune Building, where the offices and a large retail store are situated.

Distribution of the Prizes of the Society of Encouragement in France.

The Society for the Encouragement of National Industry in France is one of the most admirable benefactors of that country, for, working in silence and without show, it encourages competition in industry and art by prizes and rewards. This society includes among its members eminent scientists, skillful manufacturers, and a number of men in all branches of knowledge, who act as judges in the distribution of prizes. The present president is M. Dumas. The prizes distributed this year are the following:

1. The great medal for fine arts (*Grande médaille des Beaux Arts*), the disposal of which lies with the Committee of Building and Art.

2. The great prize founded by the Marquis of Argenteuil, which is bestowed every six years.

3. The prize "Elphège Baude," for the perfection of the materials for civil engineering.

4. Several different prizes for competition by the society.

The great medal was given to Mr. Charles Garnier, the architect of the new Opera House in Paris. Mr. Rossigneux, member of the Committee of Building and Art, read, in the name of the committee, a report in which he gave a short description of this beautiful building, one of the grandest of Europe, and paid a fitting tribute to the merits of its author.

The grand prize of the Marquis of Argenteuil was received by Mr. Alphonse Poitevin for his remarkable improvements in photography. This gentleman had already received the highest awards of France, Russia, and Austria, during the International Exhibition of 1878.

Mr. Hersent, who has at present the supervision of the harbor repairs at Toulon, one of the most skillful engineers of France, was the recipient of the golden medal of the prize "Elphège Baude," on account of his important inventions for submarine structures.

Among the other prizes may be mentioned that given to Mr. Alexis de Bisschop for the invention of his small gas motor. The following problem was solved in the construction of this motor: The invention of a motor with rotation shaft, which furnishes to the workman who has to work in his own room a power of from 43 to 145 foot pounds per second. The construction of the motor must be such as to permit the regulation of the power according to the requirements, and without much difficulty. Mr. Bisschop's invention answers all these conditions perfectly. The model of his machine presented before the society gives 36 foot pounds, and uses only two cents' worth of gas per hour (Paris price). The cost of the machine is $100. These machines are constructed by Messrs. Mignon and Rouart, in Paris, who manufacture also a larger size, costing $180, and giving a power of 180 foot pounds per second, while the cost of the gas used amounts to five cents per hour.

A prize of $400 was offered for the invention of a means by which the shock and the vibrations produced in buildings by steam hammers, etc., could be nullified. Mr. Anthoni, who solved the problem, by introducing India-rubber plates between the foundations of the machine and the floor, received $100 of this prize.

A prize of $300 was offered for the utilization of the residues of manufactories. Camille Vincent, civil engineer, and Professor of Chemistry in the Central School, received this prize, for the creation of new industries, namely, the manufacture of methyl-chlorure, trimethylamine, and some interesting applications of refrigeration, the extraction of perfumes, etc. The importance of these inventions is well known to our manufacturers of aniline colors, and Mr. Massignon, a perfume manufacturer of France, has testified that by the employment of methyl-chlorure, he is able to extract 2,200 pounds of flowers a day in his manufactory at Cannes; the compression pump used by him being able to produce 184 pounds of ice per hour.

Mr. Abel Martin, of Paris, received the memorial medal and a prize of $200, for an invention which renders tissues and wood incombustible without destroying their color.

A silver medal was awarded to Mr. Idrac, of Toulouse, for a process for the quick desiccation of wood.

Mr. Goetz received $100 for his labors in the direction of reclaiming plains with quick grass.

A prize of $300 was awarded to Mr. Petit for the invention of a process by which a photographic plate can be converted into a typographic plate. The ingenious process consists in using bichromated gelatine plates, by means of which photographic pictures in relief are obtained, copies of which can be immediately used for printing.

Besides this, 13 gold medals, 9 platina medals, 14 silver medals, and 13 bronze medals, have been awarded for other useful inventions.

ENGINEERING INVENTIONS.

An improved pumping engine has been patented by Mr. Charles B. Wells, of Ronkonkoma, N. Y. The object of this improvement is to adapt such engines for pumping water, and specially for fire engines for use in situations where a steam fire engine would be too expensive. The invention consists in the combination with the cylinders of the engine, which are formed with water jackets, of a pump having its induction pipe connected with the jacketed space of the cylinders, so that while the pump is in operation the water passing around the cylinders will keep the cylinders and pistons cool and prevent the engines from becoming inoperative by unequal expansion.

An improved locomotive lift pipe has been patented by Mr. Thomas Plain, of Elmira, N. Y. The object of this invention is to insure better combustion in a locomotive and to prevent the accumulation of cinders in the locomotive smoke box.

An improvement in turbine water wheels has been patented by Messrs. Albert L. Moore and Norman S. Parker, of Portland, Oregon. This is an improvement upon the water wheel for which letters patent were granted to the same inventor January 17, 1871. The object of the improvement is to obtain both percussive and reactionary effect by the water upon the wheel, and to construct a gate so that it may be easily operated.

An improvement in fire engine boilers has been patented by Mr. Truckson S. La France, of Elmira, N. Y. The objects of this invention are to protect the crown sheet of the boiler from the dangers of low water, to raise steam quickly, and to prevent mud deposits in the boiler tubes.

Mr. Samuel Emery, of South Toledo, Ohio, has patented an improvement in that class of brakes in which the shoe engages with a wheel which is smaller than and independent of the wheels on which the car runs. It is particularly applicable to street railway cars.

An improved triangular truss bridge has been patented by Mr. Cyrus W. Wheeler, of Brownville, Neb. The object of this invention is to proportion the several parts of triangular truss bridges in accordance with the maximum stress to which they are respectively liable, thereby avoiding needless expenditure of material.

An English Magistrate on Patents.

The recorder of Walsall (Eng.), Mr. J. S. Neal, in charging the grand jury, said the recent boiler explosion at Walsall was a most appalling lesson of the danger that surrounded all modern machinery connected with steam, and of the necessity of adopting all safeguards that invention could suggest. It was within his knowledge that a patent to prevent boiler explosions, and which had every prospect of rendering such an accident as the recent calamity all but impossible, was on the point of being taken out ten years ago, but was delayed and would probably be lost through the unjust action of the patent laws. There was no law which ingenuity could frame which would confer a greater benefit on trade and commerce, and also on humanity at large, than a reform in the patent laws by a reduction to the smallest and most nominal amount of the fees and costs in taking out new patents, and in the place of such reduction, the substitution of an *ad valorem* duty of say five per cent on every sale or transfer of every patent which by its success had become valuable. The comparative trifle for which patents can be protected in America was one great cause why she has gone ahead of us in scientific matters.

The Wheat Crop of France.

Russia, being the chief wheat exporting country of Europe, is usually considered the greatest wheat grower. Yet the wheat crop of France is much larger, her annual crop being 286,448,000 bushels, against Russia's 234,000,000. Thanks to her abundant manufactories, France finds a market at home for all her wheat; and we hope the time is not far distant when the same will be said of the United States.

Astronomical Notes.

OBSERVATORY OF VASSAR COLLEGE.

The computations in the following notes are by students of Vassar College. Although merely approximate, they are sufficiently accurate to enable the observer to recognize the planets. M. M.

POSITIONS OF PLANETS FOR OCTOBER, 1880.

Mercury.

Mercury may be seen late in October after sunset. It should be looked for some nine or ten degrees south of the sunset point.

On October 31 Mercury and the bright star Antares set nearly at the same time. Mercury can also be found by its position between Venus and the horizon.

Venus.

Venus may be seen after sunset all through the month, setting at 6h. 13m. P.M. on the 31st.

On October 20 Mercury and Venus will have very nearly the same declination, but Venus will be more than 6° east of Mercury.

Venus will be in conjunction with the crescent moon on the evening of October 5.

Mars.

Mars rises and sets so nearly with the sun that it is not likely to be seen in October.

Jupiter.

Jupiter comes into its best position in October. It is in opposition to the sun on the 7th.

The most interesting evenings in October will be the 9th, 16th, and 23d.

On the 9th (if the observer take the hours between 8 and 10 P.M.) the smallest satellite will be seen to come out from eclipse, and the next in line will pass off from the face of the planet. The planet will be seen early in the evening with two satellites only.

On the 16th Jupiter may be seen with two satellites, and as the largest satellite reappears from eclipse nearly at the same time that the first enters upon the planet's face, two moons must be seen near Jupiter.

On October 23 the largest and the smallest satellites disappear behind Jupiter within little more than an hour's time, while the first satellite approaches transit.

A telescope of three or four inches aperture will show markings and spots on the face of Jupiter, and the planet should be carefully watched by amateurs all through October, usually the best month in the clearness of the skies.

Saturn.

Saturn follows Jupiter, rising 33m. after Jupiter on October 1, and 37m. after Jupiter on October 31.

Saturn also comes into opposition in this month on the 18th. As the two planets are so near together in the skies, it will be easy to turn the glass from one to the other, and to notice the difference of light and color, the position of the ring of Saturn relatively to the planet, and the grouping of the satellites of Jupiter. And although a small telescope will show Titan only, among the numerous satellites of Saturn, it can be watched all around its revolution, and the slowness of its motion compared with the rapid motion of the satellites near to Jupiter.

A good glass of four inches aperture may show also Rhea, the satellite of Saturn next in size to Titan.

Saturn is in conjunction with the full moon on the morning of October 18.

Uranus.

Uranus must be looked for in the morning. It rises at 3h. 40m. A.M. on October 1. On October 31 it rises at 1h. 50m. A.M.

On October 31 Uranus is 2½° west of Delta Leonis, but nearly 14° south of the star in declination. It will be difficult to find it in the early morning hour without a well mounted telescope.

Neptune.

Neptune is approaching opposition and passes the meridian on October 31 almost exactly at midnight, at an altitude in this latitude of more than 62°.

Gould's Comet.

Professor Klinkerfues, of Gottingen, has published a letter on Gould's comet, discovered last February at Cordoba. His object is to point out that the probable identity of this comet with those seen in 1843 and 1868 need not be rejected because it does not appear to have been seen, although so conspicuous an object between those years. So nearly does it approach the sun (within, indeed, about 100,000 miles of its surface) that the resistance to its motion when at perihelion is likely to be sufficient to produce a very considerable diminution in its periodic time, the case being, in fact, one of resistance from the sun's atmosphere itself, and not merely, as has been conjectured in the case of Encke's comet, from the ethereal medium existing in space. Hence there is nothing extravagant in the supposition that the resistance of the part of the corona within which the comet passes may be quite sufficient to diminish its period of revolution from 175 years to 37 years. Carrying this view still further back, Professor Klinkerfues contends that it is probable that the same comet may be identical with one seen and described by Aristotle in the year B.C. 371, when that philosopher was only thirteen years old and still living in his birthplace, Stagira. He considered it likely that while the period of revolution from B.C. 371 to A.D. 1668 was 2,039 years, it was diminished by the resistance of the sun's atmosphere, first to 175 and then to 37 years; and, further, that it has at the late passages through perihelion been again decreased to 17 years, so that it may be expected that the comet will return in the autumn of 1897.

HINTS TO THE YOUNG STEAM FITTER.

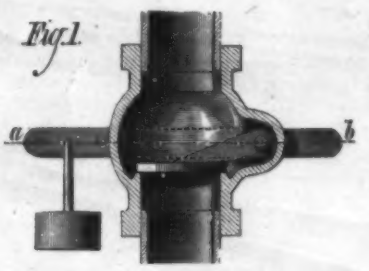
BY WM. J. BALDWIN.

EXHAUST STEAM AND ITS VALUE.

Among the many who own steam engines and the engineers who run them there are few who have a just appreciation of the *thermal* value of the clouds of exhaust steam continually blown to the winds from the apparently numberless exhaust pipes, which can be seen from the top of a high building in any of our large cities.

When I say that three-quarters of the *practical* thermal value of every pound of coal burned in the boiler furnace is lost past recovery to the consumer, I am putting it at less than the actual loss; and could this heat be converted into available motion, suitable for power purposes, it would be a boon indeed, and money in the pockets of the one who could do it. Perhaps there is a chance for the electrician to convert it into energy; but as yet engineers can use it for heating purposes only, where its full value can be shown in the heating of water, air, or any tangible substance.

Fig. 1.



The first purpose the exhaust steam is generally used for is to warm the feed water, the object being to raise its temperature as high at possible before it enters the boiler, thereby to save fuel.

The first question which nearly always suggests itself to the engineer is, How hot can feed water be made? The second which he sometimes considers, but seldom arrives at a satisfactory conclusion about, is, What percentage of the coal heap does the heating of the feed water represent? and the third, which rarely comes under his notice, is, How much of the exhaust steam from an engine can be used in heating all the feed water necessary to supply the loss caused in the boiler by supplying steam to the same engine? and how much of it is left for use elsewhere, partly or wholly, to heat the *factory* in winter or for drying purposes?

The answer to the first question is: Water under the pressure of the atmosphere cannot be heated above 212° Fah., and when the feed water passes the check valve at a temperature of 200° it should be considered good, although it is possible to do better.

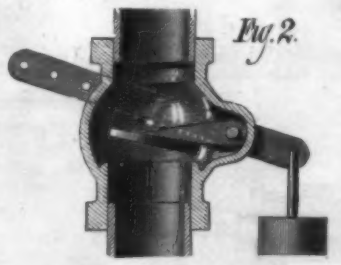
Where water is *forced through* a heater the temperature can be raised higher than when drawn by a pump *from* the heater, as the lessening of the pressure also lessens the capacity of the water for *sensible* heat.

Some makers of feed water heaters claim they can heat the water above 213, because it is under pressure; but it is evidently a mistake to attempt it, as both the water to be heated and the steam necessary to heat it should have a pressure above atmosphere, and any attempt to keep a back pressure in the exhaust pipe for the *simple purpose only* of warming the feed water above 212° is attended with a loss instead of a gain.

The attempt to heat the feed water 5° above 212° by a back pressure of 2 pounds, the mean pressure in the cylinder being 50 pounds, is attended with a loss in energy more than five times greater than the gain to the feed water.

The answer to the second question is: That when the feed water is raised from *mean temperature* (39°) to 212°, by the use of the exhaust steam at atmospheric pressure, it is equivalent to very nearly two-thirteenths of the weight of the fuel necessary to convert water at *mean temperature* to steam at *any pressure*, and 15·18 per cent of the coal heap is the greatest possible saving that can be made for this difference of temperature.

Fig. 2.



To find the saving for other differences of temperature in the feed water, divide the difference between the temperature of the cold water as it enters the heater and that at which it enters the boiler into 1,146, less the difference between the cold water and 32, and the product is the fraction of the coal heap.

The answer to the third question is: That two-elevenths of the exhaust steam is the greatest quantity that can be utilized in the warming of the feed water, and making a generous allowance for loss by radiation, etc., there will still be three-fourths of all the exhaust steam for other purposes.

The next general purpose for which the exhaust steam from an engine can be used is in the warming of the air of a building, to which purpose it is often applied, though not as much as it should be, as there appears to be an idea among many users of steam that it is just as well to take live steam from the boiler as to cause one or two pounds back pressure on the engine for the purpose of getting a circulation and driving the air from all parts of the coils.

The loss in power to an engine from back pressure is very nearly directly as the difference between back pressure and mean pressure. Thus, in an engine of 50 pounds mean pressure, with a back pressure of 2 pounds, there is a loss of 4 per cent, and as the available energy of an engine cannot represent one-quarter of the *practical thermal* value of the coal, the loss caused by 2 pounds back pressure cannot represent more than 1 per cent of the coal, and as it is an incontrovertible fact that the exhaust steam contains more than three-fourths or 75 per cent of the *practical* thermal value of the coal, the balance is largely in favor of using the exhaust steam. The steam fitter when preparing to use the exhaust, usually places a *back pressure valve* in the exhaust pipe of such construction that it can be loaded to suit, so as to reduce the back pressure to a minimum when in use, and to hold it open when not required.

Fig. 3.

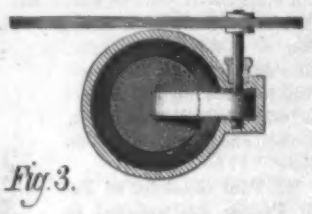
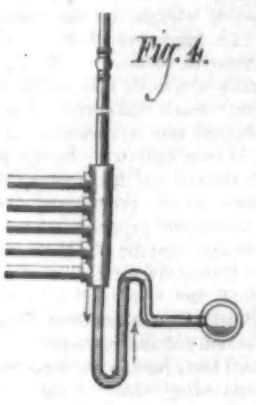


Fig. 1 shows a section of a back pressure valve with the weight hanging on the positive end of the lever, showing the position of the valve when the steam is turned into the coils. Fig. 2 shows the weight on the negative end of the lever, the position usually used in summer. Fig. 3 shows cross section on line *a b*, Fig. 1, to show stuffing box and spindle.

Exhaust and live steam should never be used in the same coil at the same time. It is often attempted, but is very difficult to regulate, and the better way is to make the exhaust coils no larger than there is steam enough to fill them, and should this not prove sufficient for the space to be heated, add live steam coils with entirely independent connections.

Fig. 4.



Sometimes coils are furnished with two sets of connections, live and exhaust; but this requires constant attention to prevent workmen, etc., from crossing the steams, thereby causing a waste.

Another objection to having live and exhaust steam connections on the same coil is the style of trapping used for one is not fit for the other.

A very good way to *trap* and provide for the condensed water from an exhaust steam coil is to have an inverted water siphon to the sewer or tank, as shown in Fig. 4, with a vapor pipe to the roof to remove an excess of pressure and the air. This pipe should have a check valve on it to prevent the return of the air between the strokes of the engine, and the water trap should be as deep as possible.

MECHANICAL INVENTIONS.

Mr. John P. McKinley, of Black Hawk, Miss., has patented an improved sawmill head-block, by means of which the knees of the head-block can be adjusted by the driving power of the mill, and it is so constructed as to enable the sawyer to set the head-blocks very quickly and accurately.

An improved machine for filing gin saws has been patented by Mr. Alexander F. McAllister, of Marshall, Texas. This machine employs rotary files, and is supported and guided by arms which engage the periphery of the saw.

Mr. Marcus M. Rhodes, of Taunton, Mass., has patented an improved apparatus for gauging and assorting disks of varying thickness, for coins, buttons, and other purposes. The invention consists of an improved mechanism for feeding disks or planchets to gauging calipers of a sliding spring caliper bar, the range of whose every movement is determined by the thickness of the disk being gauged, and a group of receiving tubes reciprocated beneath the calipers by novel mechanism.

An improved machine for making rubber belting has been patented by Mr. Jacob D. Joslin, of Trenton, N. J. This machine is intended for receiving the stock and folding and preparing the belt for vulcanization.

An improved wrench or pipe-tongs that may be adjusted without screws has been patented by Mr. Theodore P. Franke, of Buffalo, N. Y. The invention consists of a hollow internally-socketed handle, containing in its upper section a movable serrated lower jaw resting upon a spiral spring, and adjustable by means of a rod that passes up through the handle.

A RECENTLY patented compound for flavoring cigars consists of rum, alcohol, oil of apple, tonka bean, valerian root, and laudanum. Such are the vile doses that go into the smoker's mouth.

MISCELLANEOUS INVENTIONS.

Messrs. James B. Campbell and Josiah Lindsay, of Mount Sterling, Ky., have patented a cheap and durable washboard, designed to force the water through the clothes by a more substantial resistance to the hand than is afforded by other washboards. The invention consists of metal rods running laterally across the face of the board, parallel to each other and at equal distances apart, and partly bedded in the board, grooves being made in the spaces between the rods, thus substituting the rods and the grooves between them for the corrugated metal sheet which commonly covers the face of a washboard.

An improved vehicle wheel has been patented by Mr. Charles W. Ball, of Macon, Ill. The object of this invention is to construct a light, durable, and easily adjusted vehicle wheel, cast from steel or other metal, with hub, spokes, and felly all in one piece.

Mr. Paul Gondolo, of Paris, France, has patented an improved process of manufacturing tannin extracts, which consists in the following consecutive steps: First, macerating the crude material containing the tannin in slightly acidulated water; secondly, neutralizing the free acid by an alkali or its equivalent, as described; thirdly, clarifying the solution by the introduction of blood, and then raising the temperature to the coagulating point of the blood, and finally separating from the tannin liquor the coagulated blood, with the salts and coloring matter, by filtration.

An improvement in oil stills, patented by Mr. Gerard Crane, of Salamanca, N. Y., consists in a novel arrangement of a small still within a larger or main still, and another small still outside of the main still, and a novel combination and arrangement of devices employed in connection therewith, whereby the process of distilling the oil is facilitated and hastened by enabling the oil to give off the more volatile products of distillation at the same time that the heavier products are being given off, and by means of the same fire for all of the stills.

An improvement in that class of devices known to the public as "bale-band tighteners," has been patented by Mr. Charles T. Christmas, of Riverton, Miss. It consists of two end curved and cross-pivoted bars, having on corresponding sides of the ends a swiveled slotted block and cam lever.

Mr. Gilman P. Richardson, of Bath, Me., has patented an improved means for fastening together the ends of the metal bands which serve to bind together the staves of large tanks, barrels, hogsheads, or tubs. It is made in the form of two strong tubes cast together, with their axes arranged obliquely to each other. Through the tubular openings in the tie the rounded ends of the band are to be projected, and then secured upon the opposite sides of the tie by screw nuts.

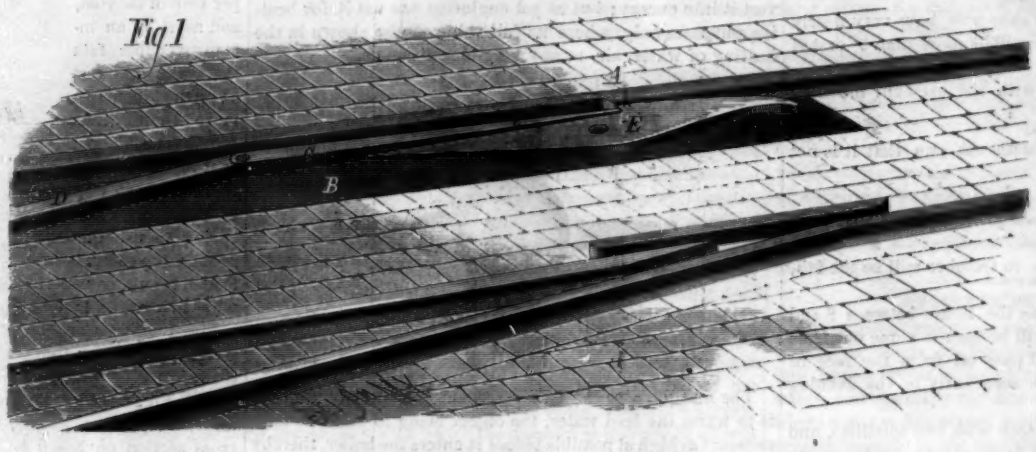
Mr. Montraville W. Atwood, of Clayton, N. Y., has patented a center-board that may be applied to any boat, but is specially adapted to a row-boat, without interfering with the oarsmen, and be contained within a box that is water-tight, excepting at its bottom or keel opening, which box may be arranged beneath thwart of the boat. It consists of a center-board constructed of two or more pieces or leaves, so that they may be folded and opened and elevated and depressed at pleasure by means of a bolt and lever, the center-board being contained in a low water-tight box above the bottom of the boat.

An improved spring hinge has been patented by Mr. George Keene, of Chicago, Ill. The improvement consists in placing the pintles of the gate or door forward of its rear edge, which is provided with a downward projection, and in applying a spiral spring to the lower pintle, so that its free ends project backward on each side of the projection on the gate or door, but do not bear against it except when the gate or door swings, being at other times in contact with studs which are fixed in the pintle bracket.

IMPROVEMENT IN RAILWAY SWITCHES AND CROSSINGS.

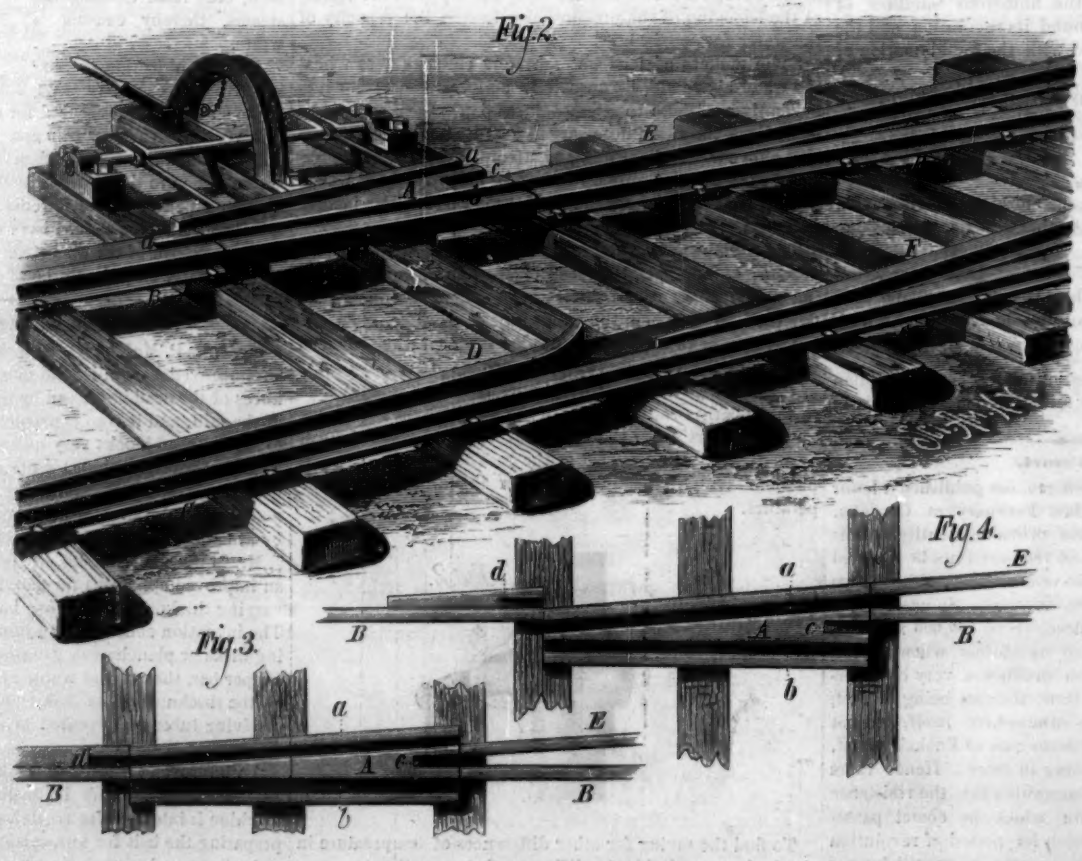
We give herewith three engravings representing some recent improvements in railroads patented by Mr. John B. Carey, and now being introduced by the Carey Switch Company, of Boston, Mass. Fig. 1 shows a switch especially intended for street railways, and designed to afford a means of operating the switches of street railways without the necessity of leaving the car to operate it.

The main track rail, A, and the other portions of the switch are supported by a base plate, B. The swinging tongue, C, is pivoted at the end of the branch track, D, in the usual way, and is capable of being acted on by the lever, E, which is pivoted to the base plate, B, near the free end of the tongue, C, and has a curved end which projects beyond the end of the tongue, so that it may be engaged by the flange of a car wheel when it is desirable to switch the car from the main to the branch track. The tongue, C, is recessed on its under side, and contains a spring which is attached to its pivot and tends to keep the free end of the tongue away from the main track. As a car approaches a siding or turnout on to which it is to be switched, and as the front wheels of the car arrive opposite the curved end of the lever, E, the car is pulled by the draught animals toward the side of the track opposite the lever; the result is that the end of the lever is forced inward toward the center of the track, thereby crowding the opposite end and the free end of the switch tongue in the opposite direction, thus isolating the main track and opening the branch, the tail of the lever, E, being of less height than the portion of the switch against which it abuts, in order that it may present no obstruction to the flanges of the wheels as they pass along the tongue. When the lever and tongue are in their normal position—that is, when the main track is open—their meeting faces are parallel, and the pivot of the lever forms a stop to the inward movement of the tongue and determines the extent to which it is moved by its spring. When the car returns from the turnout to the main track the "dummy," so called, upon the side of the track opposite the tongue and lever diverts the car toward and upon the main track, the wheels of the car upon the switch side crowding the tongue, C, outward against the main rail and permitting of the passage of the flanges of the wheels between the tongue and the lever. The length of the free end or nose of the lever is equal to or somewhat greater than the distance between the axles of the cars, in order that the front wheels of the car, in running from the main track to the turnout, shall not pass by the pivot of the lever until the rear car wheel has entered between the lever and the rail. This switch has been six months in operation at Chestnut and Thirty-third streets, Philadelphia, and is said to work perfectly. Fig. 2 shows, in perspective, a switch adapted to steam railroads, and which, it is claimed, will prevent the derailment of a car whatever the arrangement of the switch or the direction of the train. In this switch a triple rail sliding frog, A, is employed; the main track rail, B, having in it an opening for receiving the frog and in which the frog slides transversely. The main rail, C, is continuous throughout, and is provided with a guard rail, D, supported by a plate resting on the ties. This guard rail terminates at one end at a point opposite the center of the frog, A. The space between the guard rail, D, and the rail, C, is tapering, being the largest at a point opposite the middle of the frog, A. This space is large enough to allow the wheels on one side of a car or locomotive to pass obliquely on the plate from one side to the other of the point of the branch rail, F.



STREET RAILWAY SWITCH.

The movable frog is operated by means of a lever in the usual way, and may be held in either of its positions by a pin passing through the switch operating lever and its curved guides. The legitimate operation of this switch is as follows, taking for the first example the position of parts shown in Fig. 2, that is, with both rails of the main line intact, the frog being at its extreme outward position: In this position it is hardly necessary to explain that both rails of the main line are intact; but when a car, for instance, upon the turnout, is approaching the switch in this position, that is, with the switch misplaced for the turnout, the front and hind wheels of the car in succession, upon the side next the frog, on leaving the turnout rail, E, traverse the central tongue or reserve rail, A, until the end of the rail, B, is reached, when they will enter the groove or channel, *d*, ascend its inclined bottom, and ride upon the top of the block or plate, and travel along the latter, the flanges of the wheels upon the opposite side of the car in the meantime engaging with and being guided by the guard rail, D, compelling the car to travel obliquely in relation to the main track until the point of convergence of the guard, D, and rail, C, is reached, when the guard rail leads the tread of the wheels upon its own side to and upon the adjacent part of the rail, and those upon the opposite side of the car from the block, to and upon the rail, B, switching the car in safety from the turnout to the main track should the switchman neglect to shift his switch.



STEAM RAILWAY SWITCH.

When the movement of the hand lever is reversed, and it is lowered in the opposite direction, as shown in Fig. 4, the switch is set for the legitimate use of the turnout, and establishes direct connection between the turnout rail, E, and the end of the main rail, B. In this instance, if a car is approaching the switch from the right hand, the car is switched off legitimately from the main line to the turnout.

As the car travels in the opposite direction the result is the same practically, except that the order of the movements is reversed. While the wheels of the car nearest the frog travel from the turnout to the main track over the frog rail

A, under the control of the tongue, A, the opposite wheels, after leaving the rail, F, travel obliquely over the plate which supports the guard rail, D.

Should the main rail portion, *b*, of the frog become worn to such an extent as to require renewing, the tongue, A, becomes available. In this event the switch lever is to be turned into a perpendicular position, and the inner face or edge of the tongue establishes communication between the two ends of the main rail, B, as shown in Fig. 3, the rail, *b*, of the frog being out of use.

With this position of the frog the switch is misplaced for the turnout in both directions, and should a car upon the turnout accidentally approach the switch, its wheels upon the side next the frog will successively enter the groove, *c*, ascend its inclined bottom, and ride upon the top of the tongue, G, and will traverse the latter until they drop between the tongue and the outer rail or guard, *a*, and will, by the latter, conjointly with the tongue, be diverted into the groove, *d*, ascend the inclined bottom of the latter, and ride upon the top of the block, *e*, and traverse the latter, while at the same time the wheels upon the opposite side of the car, in succession, leave the point of the rail, F, traverse the base plate until they run against the guard, D, and will by the latter be diverted to the main rail, *c*, the opposite wheels, at the same time and by the same means, leaving the block, *e*, and taking to the main rail, B, thus safely leading the car from the turnout to the main track.

It will thus be seen that the continuity of one rail of the main line is never ruptured or interfered with.

Figs. 5, 6, and 7 represent an improved railway crossing by the same inventor. The novelty lies in the peculiar construction of the cruciform chairs which support the tracks at their intersection and receive the bed timbers. The crossing shown in the engraving consists of two single lines crossing each other at right angles, but the device is applicable to two or more tracks crossing each other obliquely, and is capable of being applied to either horse or steam railways.

The chair, A, which supports the tracks at the point of intersection, is shown in detail in Fig. 6. It consists of a flat plate in the form of a Maltese cross, having ribs, B, for confining the ends of the several tracks, and provided with a ledge for separating the ends of the rails of one track, forming a flangeway for the car wheels. The cross-shaped casting has pendent ears, *e*, for embracing the timbers, as shown in the engraving.

This device renders what is usually the most unreliable part of the road as strong, durable, and reliable as other portions.

Further information in regard to these inventions may be obtained by addressing the Carey Switch Company, 25 State street, Boston, Mass.

Fig. 5

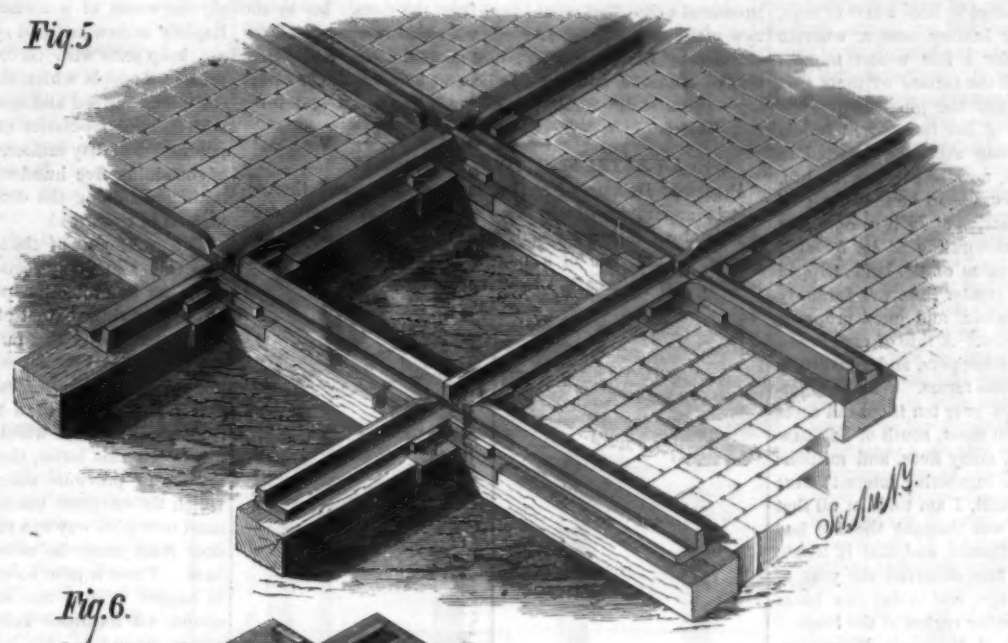


Fig. 6.

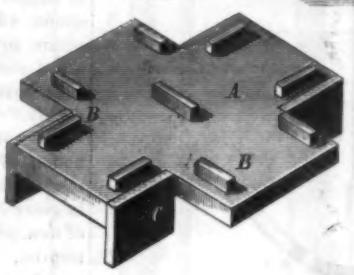
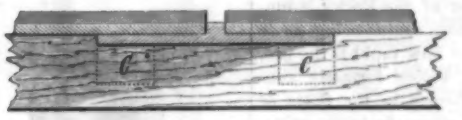


Fig. 7



RAILWAY CROSSING.

THE GRANNY WHALE.

BY A. W. ROBERTS.

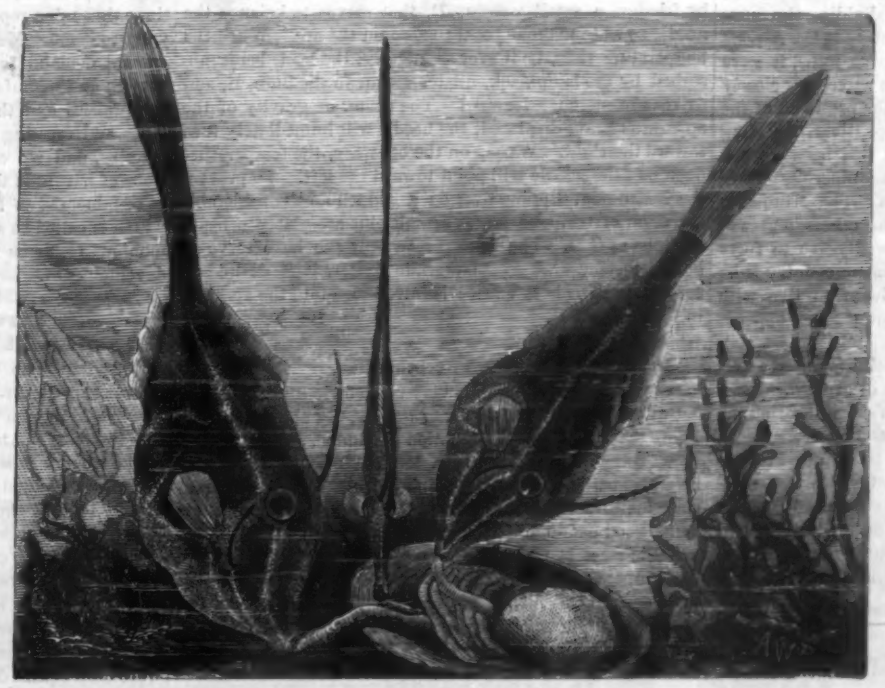
"The granny whale," "long-tailed unicorn fish," "file fish," "old wife," "trigger fish," and "fool fish," are the common and local names given to a variety of fish ranging from Cape Cod to Florida, and known to naturalists all the world over as the *Alutera cuspicauda*, but from its supposed resemblance in outline to a whale, and its generally very aged and infirm look, suggests the possibility of its being the great-great-grandparent of all fish. An adult specimen, when taken from the water, conveys the idea of its being but a mere framework of bones, enveloped in a loose-fitting, baggy, moth and tan blotched skin. Its grinning, gumless teeth, and the feeble resistance it offers when handled, suggested to the fishers of Long Island the name of "old wife," the mother of all fish. It obtains the names of unicorn fish and trigger fish from the fact of its having a prominent movable spine situated on the forward part of the dorsal ridge, which is suggestive of a unicorn's horn or a trigger handle. The name file fish was given to this fish on account of its skin being covered with minute but very keen asperities, suggestive of a fine file, emery paper, or shagreen. From the fact that it is exceedingly awkward in the water, often standing on its head with its unwieldy tail pointing directly upward, and at other times assuming an upside-down position, and the ludicrous attempts it makes at rapid swimming, together with the meaningless expression of its bulging eyes, and its generally eccentric appearance, have caused it to be dubbed the fool-fish, for it is truly a burlesque on all fishes.

There are now on exhibition at the Aquarium several unusually fine living specimens of this fish, measuring from fifteen to twenty inches in length, which were captured by W. I. De Nyse, of Gravesend Bay, L. I.

The young of the alutera is described by De Kay as a separate variety under the common name of the long-tailed unicorn fish, and the adult he names the orange file fish. In local color and markings the young of the alutera are very different from adults, they having longitudinal markings of a rich purplish-black and brown, extending from the nose to the tail, while the adults are of a general dingy orange color with markings of light brown in blotches.

In a tank at the Aquarium I placed some fifteen specimens of young alutera that were taken at the swimming baths at the foot of 35th street, East River, they having been attracted there by the immense quantity of tubularia growing on the timbers of the bath. I fed these young aluteras on clams at first, some of which remaining in the tank uneaten, I threw into the tank a couple of handfuls of Buccinum snails to clean up the uneaten food. Much to my surprise the young file fish set upon the snails, rapidly biting off their probocis. This fact led me to establish a tank with deep sand bottom, in which was thickly planted numerous small soft clams. When these had become thoroughly established I moved all the young file fish into the clam tank, the result being that in less than an hour's time not a single clam was left with a perfect siphon. Tubularians and other zoophytes are the favorite food of the file fish, they being furnished with teeth closely resembling the rodent quadrupeds', there being a provision for adding fresh substance to the tooth as fast as it is worn away.

It was astonishing how rapidly the largest masses of tubularia were mowed down close to the base by the sharp teeth of the file fish. These fish have the power of rapidly changing colors to a remarkable extent, so that when placed in a dark tank they become almost entirely black, and in a tank thoroughly illuminated with sunlight they assume a light yellowish color.



THE GRANNY WHALE.—(*Alutera cuspicauda.*)

Shower of Water Beetles.

The people of Owensville, Mount Sterling, Sharpsburg, and intermediate places in Kentucky, were recently astounded by a veritable shower of large brown, oval-shaped beetles, measuring about one and a half inches in length by half or three-quarters of an inch in breadth. They proved to be the well known water beetle (*Dyticus roselius*). Whether they were migrating or had been swept into the air by a whirlwind, does not appear.

Fasting Horses.

To determine the capacity of horses to undergo the privations incident to a state of siege, a series of experiments were made with these animals in Paris, some years ago. The experiments proved (1) that a horse can hold out for twenty-five days without any solid nourishment, provided it is supplied with sufficient and good drinking water. (2) A horse can barely hold out for five days without water. (3) If a horse is well fed for ten days, but insufficiently provided with water throughout the same period, it will not outlive the eleventh day. One horse, from which water had been entirely withheld for three days, drank on the fourth day sixty liters of water within three minutes. A horse which received no solid nourishment for twelve days was nevertheless in a condition, on the twelfth day of its fast, to draw a load of 270 kilos.

Two Patriarchal Apple Trees.

In Skowhegan, Me., are two russet apple trees; the oldest was planted in 1762. The tree is seven feet from the ground to the branches, five in number, all of which are very large and average 35 feet in length, covering a space of ground 63 feet in diameter. In these branches a playhouse for children has been built for half a century or more. Anywhere from the ground to the branches it measures 13½ feet. The tree is more than 4½ feet in diameter, and it has been a good bearer—from twenty-five to thirty-five bushels of apples having been picked from it each year. But the frost and rain have made a seam in the branches, and recently one of them has broken, but the other four are green and bring forth their fruit in due season. The other tree, forty-eight years younger, is a sprout of the old tree. It stands thirty-two feet from the old tree, and bears the same kind of apples, is three feet in diameter, and perfect in every way. This farm was deeded to the grandfather of Coburn Ireland in 1760, has passed

from father to son until 1876, and then passed into the hands of Daniel H. Gould, the present owner.—*Boston Transcript.*

The Pine Tree Passing Away.

A correspondent of the *Cincinnati Gazette*, writing from Alpena, Mich., says:

Alpena is one of the many Michigan towns that are springing up along the lake shore at the mouths of rivers whose tributaries flow through the great pine forests of the State. Every river throughout the constantly receding timber belt of Michigan, now reaching from the Saginaw Valley to the Straits of Mackinaw, sufficiently large to float a raft of logs, becomes a highway between the lumber camps, wherein motley crews of men, gathered for a few winter months from all nations of the world, rob the forests of their precious pine. The time is near when the pine hoarded by nature for ages within the bosom of her forests will be exhausted; when the rough woodsman will have departed to other lands; when the saw mills, now bustling with life, will stand silent and deserted. What is to be the future of this region when that time shall arrive? Is it to remain a useless waste, awaiting the slow restoration of its forests? It is certain that the agricultural value of the land stripped of its pine is proving to be much greater than was formerly supposed. Clearings are being made, and good crops of wheat, oats, hay, and potatoes raised. A tide of emigration in this way is following the woodchoppers, and converting the mutilated forests into prosperous farms. When the terrible forest fires of Michigan swept over ten thousand acres of pine land along the Lake Huron coast, south of Saginaw Bay, and destroyed whole towns, many lives, and millions of dollars' worth of property, the lumbering interests were utterly destroyed. Not a single mill, I am told, in all that region has since been built. It was thought the fire had ruined the future of the burned district, and that it would be henceforth valueless. These fires occurred the year of the Chicago fire, just nine years ago, and to-day this burnt district is said to be the finest farming region of the State.

The destruction of the pineries of Michigan, Wisconsin, and Minnesota is a matter of importance. How long will the forests of these three States, that contain the chief stores of pine timber on this continent east of the Rocky Mountains, continue to supply the enormous drains being made upon them? One example will show how rapid is the process of destruction. The Saginaw Valley formerly contained the largest and finest pine forests in the State of Michigan. Mill after mill was built along the banks of the river, until their united capacity reached six hundred million feet of lumber per year. To supply these mills the pine in the Saginaw Valley has been already in great part exhausted, and mill owners are obliged to bring logs from other rivers, often as far as one hundred and fifty miles distant, to supplement the stock of the Saginaw River. The output on that river has reached its climax. No more new saw mills are built or old ones replaced. The business must gradually diminish in volume until the Saginaw Valley, now the greatest lumber district in the world, shall hear the buzz of the saw no more.

Talking to a gentleman of Alpena, who has witnessed the growth of the lumbering business of that place almost from its commencement, and whose business for years has kept him accurately posted as to the quantity and location of the pine in the Alpena district, he said that, dividing the number of millions of feet of pine timber tributary to the Alpena river by the annual capacity of the Alpena mills, it gave them fifteen years' supply. These figures agree very closely with those given me a few weeks ago by the president of the largest logging company on the Mississippi River, operating in the Wisconsin pineries, a region that had been worked much less extensively than the Michigan pineries. They would last, he said, thirty or forty years. The Minnesota pineries are not so large as either of the others, and will probably not survive them. In from twenty-five to forty years the last tree will be cut, and the entire country from Maine to the Rocky Mountains must learn to live with meager quantities of pine lumber brought at great expense from distant countries.

The pineries cannot be replaced. A full grown tree represents hundreds and hundreds of years of growth. I saw small pines, no larger around than a man's arm, bearing the scars made by the axes of the United States Engineers thirty-five years ago. What ages, then, must be required to produce a tree three or four feet in diameter? When these forests reach the condition of the pineries of Maine and New York, and become extinct, no new ones will take their places. The American of the near future must learn to hew and build without pine, and marvel at the thoughtless recklessness of his ancestors.

Rust-Proof Iron.

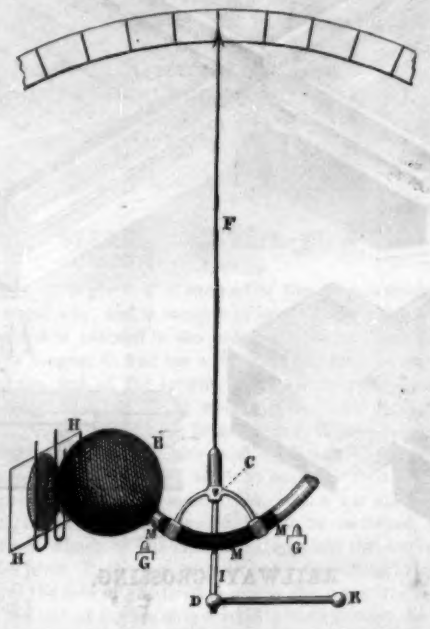
Mr. George Bower has invented, and his son has improved, a process for coating iron with an indestructible surface of magnetic oxide, which is said not to be open to the objections to the Barff process.

The process, which is not secret, consists in heating the articles to be coated in a closed chamber by means of carbonic oxide, heated air being made to enter the chamber for the double purpose of burning the gas and for combining with the iron. The excess of air, after burning the carbonic oxide gas, combines with the iron, forming first the magnetic oxide, and then the hydrated sesquioxide, or common iron rust. By shutting off the supply of air until only enough is admitted to burn the carbonic oxide, the rust is converted into the magnetic oxide. The process is repeated until the film is sufficiently thick for the purpose of protection. When complete the film has a beautiful French gray tint.

The London *Times* states that the application of this invention has been undertaken on a large scale, the chamber where the oxidization is now carried on being large enough to contain about a ton of miscellaneous articles. The value of the invention, and of the method of applying it, is no longer a matter of doubt, the severest tests having been made of the iron coated. The earliest experiments only produced a film that would peel from the metal; but by the new method a coating is made which is inseparable from the metal. Inasmuch as the cost of oxidization is less than that of a coat of paint, it has become evident that the next generation, at least, may be happy with cheap and indestructible iron.

AN EXTRA-SENSITIVE THERMOMETER.

Professor Dufour, of Paris, has devised a small thermometric apparatus, which is so sensitive that it will even denote, by a deflection of the index needle of nearly two inches, the entrance of a person in the room where it is placed. By putting the hand near the bulb the needle is



DUFOUR'S EXTRA-SENSITIVE THERMOMETER.

deflected the whole extent of the graduated arc. This apparatus, which we find described and illustrated in *La Nature*, consists of a bent tube, M, carrying at one end a bulb, B, which is coated externally with lampblack. The tube is filled from M to M with mercury, and is supported by arms pivoting at C on a steel knife blade. Just above the pivot is fixed an index needle which moves across a graduated arc. Beneath the pivot hangs a rod, I, to which is attached by friction a small weight, R, that serves to balance the needle so as to make it point to zero on the arc. When the temperature rises, be it ever so slightly, the heat, being absorbed by the lampblack, dilates the air in the bulb, B, and drives the mercury forward. The center of gravity of the apparatus being displaced, the needle will immediately turn toward the right. When, on the contrary, the temperature decreases the needle will point toward the left. To prevent the instrument tipping over on a sudden and considerable elevation of temperature, two small pins are placed beneath the tube at G G. The books seen near the bulb serve to hold substances whose diathermic powers it is desired to ascertain. The heat source is introduced into the aperture in the plate, H H.

Coret's Thermometer.

Coret solders end to end many concentric tubes of different metals, steel and zinc for example. By alternating the joints the differences of dilatation are added, so that the last tube, being connected with a toothed wheel or series of levers, gives a great motion to a needle, sufficient to indicate small fractions of a degree of temperature. The metals being good conductors, the indications are rapid when the metallic mass is placed in contact with any body of which the temperature is desired. The tubes can be concentrated in a space of less than two centimeters (0·79 inch). The thermometer is, therefore, very convenient for medical use. —*Bull. de la Soc. d'Encour.*

Where the Lumber Goes.

Were any illustration needed to exemplify the fact that the demand for lumber and timber product was on the increase, it were only necessary to see the immense quantities which are being shipped daily to the far West, and to examine the order books of our principal yard dealers. Shipments to Nebraska are nothing more than is found in the ordinary course of trade, but these as a rule are to established yards; but when it comes to shipments to points far from the line of roads, and where a large cartage expense is necessarily entailed, we begin to realize that the country is rapidly settling up, in advance of the building of railroads, which will each month make demand for greater quantities of lumber in the building of houses, barns, granaries, and fences.

Shipments have been made, during the past week, of fencing for points fifty miles north of the Union Pacific Railroad, three hundred miles west of Omaha. This and other shipments to the same State is to be used in building fences around cattle ranges, at points where, but a few years back, the wild Indian roamed at will in his hunt for the buffalo which abounded upon the broad prairie that is now brought, or rapidly being brought, into subjugation to supply the wants of a numerous population of civilized men. Rapidly as new railroad systems are being created, they do not keep pace with the restless activity and daring enterprise of a people which has spread in a single century from the circumscribed and sparsely settled coast of the Atlantic, with its total population of four millions, to an equally sparse population of fifty millions scattered over a continent capable of sustaining five hundred millions, without crowding and without attaining the density which characterizes the older nations of the world.

The grain crop of the season is unexampled in its abundance, and in many sections but scant provision has been made for its protection pending its sale. Since the harvest has disclosed the extent of the property to be taken care of, the poorer among the farmers having ascertained that they can pay for it, are now looking for the lumber requisite to protect the grain they have raised, and the cry, while imperative, comes from a newly-settled country, as well as from those portions which have been longer under improvement. In this latter, the crop of this year is but supplemental to previous successful ones, and the dug-out in which the emigrant has been content with a simple shelter, must now give way to a comfortable dwelling, while the outdoor stack must be more safely housed in granary or in barn. There is now no endeavor on the part of the dealer in lumber to urge the sale of his stock. It is wanted in almost all localities fully as rapidly as the dealers can obtain it, and in this market the demand is as heavy as the dealers desire to turn over their stocks, and, so far as assortments go, heavier than they can conveniently supply.

The condition of things described above is a full explanation of the immense demand for lumber from the railroads which are extending main lines and building branches in every direction, to accommodate and to extend the area of new settlement, and as well to take advantage of the enterprise, which is the outgrowth of the older and more populous localities. The mills of the Northwest, and as well those upon the lines of travel in the South, have, throughout the entire season, been utterly unable fully to respond to the demands which have been made upon them for railroad timber used in the construction of bridges, culverts, and depots, and with every railroad improvement the march of settlement has ever increased. During the last fiscal year, the government reports show an emigration from foreign lands of nearly five hundred thousand souls, whose demand for lumber, at the general average of five hundred feet to the person per year, will amount to two hundred and fifty million feet. This is in addition to the increase in the demand from the natural increase of our previous population, and, from present indications, will continue through a repetition or continuance of emigration for years to come. Meantime, our leading cities display an increased demand for wood products, in their expansion of growth and manufactures, while the growing population of the prairies and the Western mountains are building villages and creating new cities. Truly, this is a wonderful country, and we cannot but admire the beneficent provisions of nature in the adaptations of timber growth, as well as of minerals, to the sustenance and comfort of the people which is called so speedily to transform its wild and inharmonious elements into elements of grandeur, growth, and development.—*Northwestern Lumberman.*

The Sweet Potato Crop.

The *Tribune* obtains from one of the leading dealers in sweet potatoes in Washington Market, the following information in regard to the sweet potato crop of 1880: There is now no doubt that there will be an abundance of sweet potatoes this year. Along the east shore of Virginia, where most of the stock is now coming from, there was a large amount of ground planted, and the yield has been very good; the quality is excellent. Delaware "sweets" are just beginning to arrive, and there, also, there will be a good crop. It is probable that the crop generally will exceed that of last year. The Delaware tubers are considered the best, and the Virginia stock ranks next. A considerable quantity is raised in New Jersey, but they are of inferior quality, generally small, and cook unsatisfactorily. A large part of the Delaware crop is kiln-dried every year to make them keep late in the winter. The crop is planted at different times, so that it matures about as fast as wanted during the fall. Farmers began digging some time ago, and will continue until November.

The bulk of the crop comes to market in sailing vessels, which hold from 500 to 1,000 barrels each. Large quantities also come by the Old Dominion steamers from Norfolk and Richmond. Others are shipped by railroad by the way of Baltimore. Sweet potatoes are generally packed for shipment in barrels with canvas tops. Holes are cut in the sides to admit the air, as they are more delicate than their Irish cousins and

easily decay. Sometimes they are shipped in bulk by vessels, but then they are less likely to keep well. Large quantities are reshipped to Albany, Troy, Hartford, New Haven, Providence, Boston, and lesser cities. At present the best sweet potatoes are selling at $2.50 a barrel, and common stock at $2; but dealers expect prices to drop to $1.50 a little later in the season. Plump, bright tubers will be found to have the best cooking qualities; those which are elongated and dark colored are always inferior. Efforts to raise sweet potatoes in New York and other Northern States have not met with much success. Some are raised in the West, particularly around St. Louis, and with these that part of the country is supplied.

What Machinery has Done for Agriculture.*

In visiting the fairs the observant person will be attracted by the usual brilliant display of agricultural machinery. It may be very well worth while, as he views these exhibits, to give a passing thought to the benefits which agriculture has derived from the genius and the labors of the mechanician. We may go back in thought to the time when the spade, the hoe, the sickle, and the flail comprised the farmer's store of machinery, and when the plow was the rudest contrivance, hardly worthy to be called a tool. Then every man tilled the soil or engaged in pastoral pursuits because it was all one man could do to provide himself and his dependents with food. Then each man was forced to clothe himself and be his own mechanic for this simple reason. He labored long and with infinite pains, and the ancient sentence that man should earn his bread by the sweat of his brow came home to him with unmitigated force.

In course of time improved and effective tools so lightened the labors of the agriculturist, and so increased his products, that the opportunity to make a division of labor arrived, because there was food to spare for the mechanic. And so this condition of things became more and more firmly established until it changed the whole social and political aspect of human affairs. And now what do we see? The use of the most effective agricultural machinery and the mechanical facilities for transporting these, now so cheapen products, that the whole social fabric of the oldest civilized nation of the world is threatened with revolution and reconstruction; and it is the reaper, the self-binder, the steam thrashing machine, the locomotive, the steel rail, and the steamship, that have, in their combined effect, brought dismay and dread to every man in Europe who lives on the fruits of the labors of his fellow men, the land owners who live upon rents. The true "landlord" is now not the owner of an English estate, but the farmer who commands an army of farmers, with brigades of plows, reapers, and other machinery upon the plains of Western America. He makes laws for countries thousands of miles away, and his products rule the world's markets. The genius of agriculture today is the mechanic; the soul of agriculture is the inventor. One farmer can now, with the help of machinery, feed a hundred men with greater ease than at one time he could feed himself alone. The farmer supports the railroads, for stocks rise and fall with the good and indifferent reports of what the harvest shall be. He supports lines of steamers with his wonderful freights of breadstuffs, provisions, meats, cattle, and sheep. He maintains the millions of artisans who clothe and shelter him and who provide for every one of his wants outside of the field.

The mechanical power of the age is like a series of concentric and eccentric circles, of which the farmer stands out in the principal center. These all revolve with and about agriculture, and the same force sets all in motion. It is the farmer's duty now to make the most of his opportunities. He should be the foremost man of the age. His influence should be felt everywhere. It is felt everywhere, for the wealthiest merchants and capitalists and the most active politicians all ask themselves how far the farmers can be depended upon, before they make a movement in their special pursuits. But the farmer should feel this himself. It is one thing to have power and another thing to be cognizant of the possession. Let the farmers consider now their position, and as they take a view of it let them consider what they owe to the power and influence of machinery.

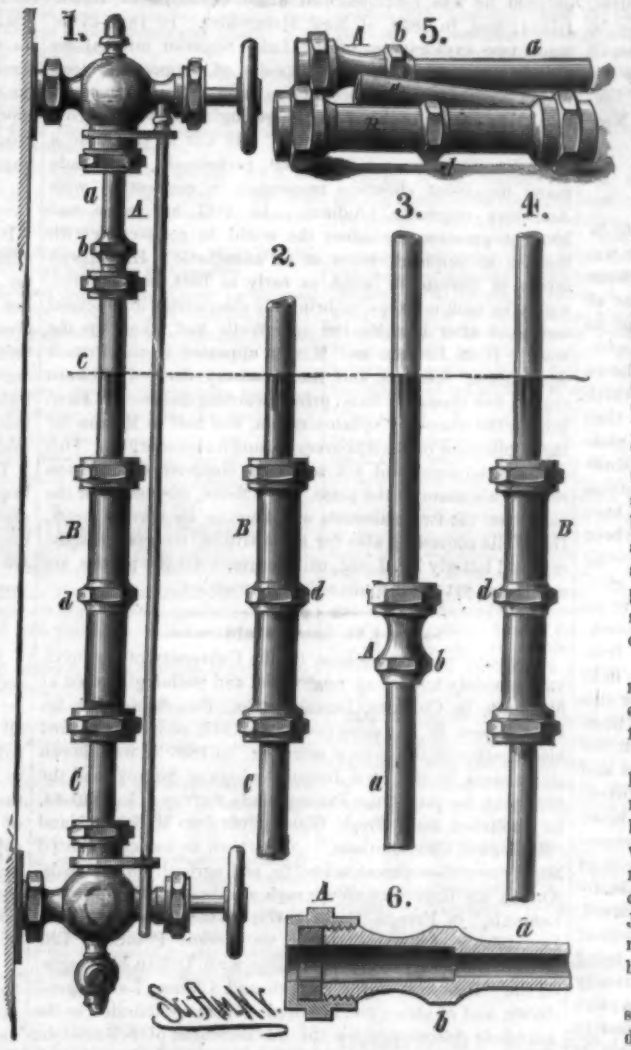
In conclusion, one most conspicuous example of the results pointed out may be noted. A few years ago Minnesota spring wheat was graded very low in the grain markets and brought a low price. Unfortunately for the Western farmers this grade of spring wheat was the only one they could produce. A "new process" in milling was introduced. Elaborate machinery was invented to perfect the process. The best wheat by this process was the grade known as "Minnesota spring," theretofore despised and rejected—literally "rejected," in fact, in the markets. Afterward this grade became sought by millers, and the value advanced to a point equal to and sometimes more than that of the previously much sought winter wheats. If Minnesota farmers produce forty millions bushels of wheat annually, this advanced value, due to the new process, puts several millions of dollars yearly into their pockets; and what a vast amount of comfort and happiness may be secured by the right use of so much money. Here we have but one instance only of the vast concatenation of circumstances which points the moral here alluded to.

*Henry Stewart, in the *Rural New Yorker*.

IMPROVEMENT IN WATER GAUGES.

A person unacquainted with steam and steam boilers can scarcely realize the trouble, occasioned by the breaking of water gauge glasses and the vexation experienced in trying to run a boiler properly after the last tube is broken and gauge cocks are to be depended on for determining the level of the water in the boiler. In some instances water gauge tubes last for a long time, but it more frequently happens that they occasionally if not frequently break, and the boiler rooms are few that cannot exhibit a pile of broken water gauge tubes. This breakage is not only the cause of a great deal of trouble, but it is expensive, and where tubes of the larger sizes are employed the expense is considerable.

The engraving shows a device recently patented by Messrs. Nunns and Clough, of West Cheshire, Conn., for utilizing broken water gauge tubes. This device is very convenient and may be applied in several different ways. It consists of three principal parts, A, B, and C. The part, A, has a tube, *a*, corresponding in size to the glass tube in connection with which it is to be used. It has a stuffing box containing a packing ring for receiving one end of the glass tube, and is provided with a fixed nut or hexagonal collar *b*, by which it may be held when one end is



NUNNS AND CLOUGH'S EXTENSION WATER GAUGE

being coupled. The part, A, is complete in itself, and may be used in connection with a piece of water gauge tube too short for use in the ordinary way, and its tube may enter either the upper or lower tube holder as may be desired.

The tubular piece, B, has a stuffing box at each end for receiving either two pieces of glass tube or a tube, *c*, of glass, and the metal tube, C, and in the middle of its length there is a hexagonal collar, *d*, for holding it while the stuffing boxes are adjusted.

As represented in Fig. 1, all of the parts, A, B, C, are used, the short section, *c*, of glass tube being sufficient to answer the purpose of indicating the water level. In this instance the part, A, is uppermost, but the order of the arrangement may be reversed. Fig. 2 shows the manner in which the tube may be lengthened by employing the parts B and C, the latter being capable of sliding more or less into the former.

Fig. 3 shows the glass lengthened by the application of the part, A, and Fig. 4 shows the part, B, used to connect two pieces of glass tube. Fig. 5 shows the several parts in detail, and Fig. 6 is a longitudinal section of the part, A, showing the construction of the stuffing box and exhibiting the enlarged portion into which the glass tube is inserted.

It will be seen that this device is capable of a great variety of applications, and it must be evident to engineers that at the price at which it may be afforded it will pay for itself over and over again in a short time.

These attachments are made in different sizes to suit the wants of different purchasers.

Further information may be obtained by addressing the Extension Water Gauge Company, Cheshire, Conn.; New Haven, Conn.; or C. N. Marcellus & Co., agents, No. 91 Liberty street, New York city.

Treatment of Burns.

Dr. Shrady, of this city, recommends that burns be treated by applying a paste composed of three ounces of gum arabic, one ounce of gum tragacanth, one pint of carbolized water (one part to sixty), and two ounces of molasses. The paste is to be applied with a brush, renewed at intervals, and is stated to be a successful method. Four applications are usually sufficient, the granulating surfaces being treated with simple cerate or the oxide of zinc ointment, as indicated.

The Exportation of Cattle.

The recent sailing of five ocean steamers laden with cattle from this port in one day, all belonging to or chartered by one firm, caused the *Tribune* to make special inquiry with regard to the present extent of the trade and the manner in which it is carried on. It appears that, in spite of the restrictions upon the movement of American cattle in England, the exportation of live cattle is superseding that of dressed meat. The shipments last season were 105,324 head; thus far this year the number has been 118,000. Besides these many shiploads are sent by way of Canada. New York, Boston, Philadelphia, Baltimore, Portland, and Montreal are the ports of shipment. New York leads; Boston ships two-thirds as many as New York; Philadelphia and Baltimore rank next, and both exceed Portland. The aggregate trade, including sheep, approaches $35,000,000 a year. The largest dealer in this city, Mr. T. C. Eastman, told the reporter that the trade in live cattle opened about four years ago. The trade in dressed beef began in 1875, and six months later the live cattle trade. The low freights on live cattle give that branch of the trade a decided advantage, notwithstanding the restrictions on the other side. Owing to the discrimination in favor of Canadian cattle, large numbers from the States are shipped by way of Montreal. Those go to the North of England, and are sent to the southern districts as Scotch cattle, bringing the highest prices. The same cattle sent from New York or Boston are not allowed to go out of the receiving depot, and must be slaughtered within seven days. The exported cattle come principally from Ohio, Kentucky, Illinois, Iowa, Missouri, Kansas, Nebraska, and Colorado. There are some cattle brought from Texas, but usually they are not so large or fine as the others. They are all slaughtered here and sent to Europe as dressed beef. Only the largest and finest animals are sent alive. The live cattle bring here from 9½ to 10 cents a pound for good shipments. Different dealers give prices ranging between $75 and $100 a head. The selling price on the other side was placed as high as 15 cents a pound.

The trade began experimentally in 1875, and no record was kept of the number exported. The growth of the business since then is shown in the following figures:

In 1876 the shipments amounted to 22,500, nearly all dressed carcasses. In 1877 the number had reached 60,000, of which number one quarter were live cattle. In 1878 the shipments were 95,600, of which 30,000 were live cattle. In 1879 the number reached 105,324, of which amount 33,295 were live cattle, and 72,029 dressed carcasses. For 1880, from January up to the first two weeks of August, the shipments were 64,843 live cattle, and 53,533 carcasses of beef—a total of 118,376.

HOW THE CATTLE ARE SHIPPED.—The method of shipping the cattle and other details were obtained from down-town dealers. There are several steamers, not belonging to any regular line, which are chartered as needed by commission merchants in this country to go to any part of Europe. These steamers average generally between 1,200 and 1,500 tons. One firm alone controls no less than thirty such unattached vessels. Besides these vessels, nearly every passenger steamer for Liverpool, London, and Glasgow carries a cargo of cattle, except on two lines. The cattle are shipped to Antwerp, Havre, Glasgow, and Deptford, which is about fifteen miles from London. The vessels taking cattle to England also carry general cargoes, which they discharge on the Continent after first landing their cattle. The reason for this is that there is a greater demand for small general cargoes on the Continent than in England, and vessels are not allowed to carry over their net registered tonnage on account of the insurance.

Cattle are taken on and under deck in stalls measuring 2 feet 8 inches on vessels sailing from New York, and 2 feet 6 inches on those from all other ports of the United States. These stalls are built under the supervision of an insurance inspector. The rate of freight this season has ranged from £4 15s. to £5 10s. a head, in advance. This rate includes covered room for necessary fodder and passage to destination and back for one attendant to every thirty animals.

During the summer shippers prefer to ship on deck, as the cattle get more air and come out fresher at the end of the voyage. On deck the steamships carry between 150 and 175 animals, and under deck about 225 head. Drinking water is condensed by steam process on board for their use, the ocean itself proving a never-failing source of supply. The rates are exacted in advance, as cattle are considered not so safe a risk as wheat and other commodities. The cattle are generally put on the steamer in the stream, after it has left the dock, an old ferryboat usually being used for the purpose. They are shipped at points all along the river front, from Sixty-fifth street to Pier No. 1, and even down

the bay, according to convenience. The number of cattle to be taken is regulated by the insurance inspector, and cattle exporters must pay the entire freight, according to his report, even if they do not ship the entire number.

Sheep and pigs are stowed in stalls on deck where there is not room enough for the cattle. Sometimes in the early spring, when the sea is liable to sudden disturbances, some of the cattle get overboard, and then a very lively time ensues in getting them out. The cattle are hoisted on board usually and lowered two at a time by a winch into the hold. The allowance of water is from six to ten gallons a day to each bullock. The amount of fodder averages one ton to each animal. The rates of insurance apparently vary. Some shippers give it as from 3 per cent in summer to 10 per cent in winter. There is more risk to the cattle from perils of the sea in the latter season, as a heavy storm may make it necessary to lighten the ship by throwing the entire deck load of cattle overboard. Shipments in winter are not very heavy, although last year a handsome profit was realized on a selected lot of extra fine cattle sent to supply the English with their Christmas roast beef. The New York shippers allow more space to the cattle than shippers at other ports. The carrying capacity of the vessels, of course, varies; but the average, as given by an old shipper, may be put safely at 200 head at a shipment, taking large and small vessels into account. On some of the larger steamers the number has reached 500, and one Boston steamer has carried as many as 841 head. The largest shipment from New York by one steamer was 650 head.

Science in Flour Manufacture.

Until recently it was believed that the only thing to be sought for in the production of a good article of flour was a more or less fine disintegration of the kernels of wheat. As long as millers held to the theory that grinding was all that was required, a large percentage of the flour had its nutritive powers greatly reduced by being ground to an impalpable dust. Science, by aid of the microscope, has shown that no really good bread can be made from flour in which any large portion of the starch globules have been thus broken down. The rising of bread is due to the starch globules which remain whole, while the dust from the disintegrated ones, by souring, impairs the lightness and sweetness of the loaf. It is but recently that these facts have been made known to millers, and since that time they have been discarding their old theories and machinery and devising improvements with the view to separating the starch globules, rather than pulverizing them. Another important advance in this industry consists of an improvement in bolting machines. Until recently the bran was separated from the flour by a powerful air blast, which blows off the light particles of bran. Considerable power is required for this process, and although it is carried on in a closed room, there is not only a great waste of the finer particles of flour, but the impalpable dust penetrates every part of the mill and often gives rise to destructive explosions. By a recent invention, electricity is made to take the place of the air blast. Just over the wire bolting cloth, which has a rapid reciprocal motion, a number of hard rubber cylinders are kept slowly revolving and rubbing against strips of sheepskin, by which a large amount of fractional electricity is evolved. Then, as the middlings are sieved by the reciprocal motion, the lighter bran comes to the top, whence, instead of being blown away by an air blast, it is attracted to the electrically charged cylinders, as light substances are attracted to a piece of paper, or a stick of sealing wax which has been smartly rubbed. The removal of the bran from the rollers, and its deposit on one side, are readily effected, while the flour is carried in another direction. The separation is thus made complete, with very little loss of dust. Still another device has been introduced, to remove from the wheat, before being ground, small pieces of iron, which, despite the utmost care, will find their way into the grain, working great injury to mill machinery. This trouble is now remedied by the use of a series of magnets, directly under which all the grain is made to pass. These magnets readily capture all the stray pieces of iron from the wire bands used in binding; and they have also revealed the singular fact that, of the scraps of iron and steel which find their way into the grain, fully one-third are something besides the binding wire. They are of larger proportions, of varying character, and much more hurtful to the machinery than the wire. Thus it is that science is constantly coming to aid all the varied industries, lightening the labor of the workmen, decreasing the cost of products, and in every way improving all the various processes which are involved in the improved and constantly advancing civilization of the age.—*The Weekly Astorian.*

Alarm Telephones.

A Chicago police officer suggests the addition of telephone boxes to the system of alarm telegraphs in use in our cities. In connection with the alarm a reserve force is to be maintained at the stations with wagons and ambulances, and all the paraphernalia necessary for riot or accident. Should it be a murder, robbery, or any other crime, the perpetrators of which have escaped, the alarm is to be given to every man in the district by sounding a large bell, which is to be placed upon the roof of the station. Upon hearing this, every officer on duty is to run to the nearest telephone box and correspond with the station; and it is also proposed that they report by the same means every hour, whether anything occurs on their beats or not.

Dr. Charles Thomas Jackson.

Dr. Charles T. Jackson, for many years one of the most active scientific men of this country, died at Somerville, Mass., August 29. He was born at Plymouth, Mass., June 21, 1805, and graduated in medicine at Harvard in 1829. Already he had directed his attention to geology, then an infant science, having been engaged with Francis Alger in a mineralogical and geological survey of Nova Scotia in 1827–29. He went to Europe to continue his medical and scientific studies, and while in Vienna, in 1832, he assisted in the dissection of two hundred victims of the cholera epidemic then prevailing, and published a detailed account of his observations the same year in the Boston *Medical Magazine.* At Paris he paid great attention to magnetism and electricity, and brought home an electro-magnet, galvanic batteries, and other apparatus. Conversation with Dr. S. F. B. Morse on the possibility of an electro-magnetic telegraph, during the homeward voyage, led to a claim on the part of Dr. Jackson that the essential features of the electro-magnetic telegraph, as patented by Morse in 1840, were originally invented and explained to Morse by him. In 1836 Dr. Jackson was appointed State Geologist of Maine; in 1839 he was commissioned State Geologist of Rhode Island; and, in 1840, of New Hampshire. In 1844–45 he made two explorations of the Lake Superior mineral regions, discovering the vast deposits of copper and iron which have proved so productive there. During the next two years he was engaged in the geological survey of government lands in the same region. He was at that time a frequent contributor to scientific periodicals, and made many important chemical researches in connection with American vegetable products. In 1847 his name was brought prominently before the world in connection with the use of sulphuric ether as an anæsthetic. His experiments in anæsthesia began as early as 1834, but unfortunately he took no steps to bring his discoveries in practical use until after Drs. Morton and Wells had taken up the work. Both Jackson and Morton appealed to the French Academy of Sciences, and the Academy divided between them a five thousand franc prize, awarding half to Dr. Jackson for the discovery of etherization, and half to Morton for the application of the discovery to surgical operations. This decision, however, did not settle the controversy. Morton refused his share of the prize, and a fierce discussion of the merits of the two claimants was kept up for several years, Dr. Wells contesting also for the credit of the great discovery, and latterly Dr. Long, of Georgia. All the parties are now dead, yet the dispute remains unsettled.

Samuel Stedman Haldeman.

Professor S. S. Haldeman, of the University of Pennsylvania, widely known as a naturalist and philologist, died at his home in Chickies, Lancaster Co., Pa., September 10. He was born in the same county in 1812, and early turned his attention to the natural sciences. In 1836 he was chosen an assistant in the New Jersey Geological Survey, and the next year he joined the Pennsylvania Survey. In 1840–44, he published his "Fresh Water Univalve Mollusca" and "Zoological Contributions." Since then he has contributed largely to philosophical, scientific, and agricultural journals. Among his important monograph are those on the "Genus Lehtoxis," in French (Paris, 1847); on the "Zoology of the Invertebrate Animals" (1850); on "Some Points in Linguistic Ethnology" (1849), dealing with Indian languages; on the "Relations of the English and Chinese Languages" (1856); and of above one hundred papers contributed to the American Association for the Advancement of Science, the AmericanAcademy, American Philosophical Society, American Philological Association, Academy of Natural Sciences, and many other learned societies of which he was a member. His work on "Analytical Orthography" won in England, in 1858, the highest Trevelyan prize over eighteen competitors. During recent years he has taken great interest in spelling reform.

A Chinese Funeral.

At the burial of Lee Wau, in Evergreen cemetery, Brooklyn, N. Y., the other day, some of the mourners cast into the open grave a few handfuls of earth, just as Christians do. Then began the curious part of the ceremony. Fagots of slow matches were bound together and planted in a basin of ashes and loose earth at the foot of the grave. On being ignited they sent up a fragrant smoke. Red candles richly decorated with figures in gold, blue, and green, were placed in a row near the fagots, and quickly burned down to the little sticks on the end of which they were fastened. The dead man's clothes, including a white shirt somewhat the worse for wear, a freshly laundered collar and handkerchief, a blue silk blouse, and a straw hat, were then rolled into a bundle and cremated near the grave, and the bright-colored and gilded wrappings of the candles and slow matches were added to the burning heap. A cocoanut mat was then unrolled beside the grave, and the Chinamen, coming up one after another, took a formal leave of the departed. This was done by clasping the hands, lifting them to the chin, and letting them drop, repeating the operation three times. After this the mourners dropped upon their hands and knees upon the mat, and made a triple salaam, bowing their foreheads close to the earth. Tea was poured from a quaint little pot of blue and white porcelain into minute cups of egg-shell china, and each man, as he bade farewell to the dead, sprinkled a spoonful of the tea upon the ground. Three pans of rice, a broiled chicken, and a plate of mutton were allowed to stand before the grave for some time, that the dead man might refresh himself and prepare for his long journey. It is customary to leave these dishes beside the grave, but just before the cortége returned, a Chinaman, whom opium had bleached, bleared, and sallowed into the resemblance of a corpse, gave a suspicious glance at certain of the small boys who had gathered about the place, and shuffled them back into a tea box whence he had taken them. Cigars were passed around, and then the yellow faces were once more shut up in the carriages, the drivers mounted to their seats, cracked their whips, and the procession disappeared rapidly in the dust.

AGRICULTURAL INVENTIONS.

Mr. Martin H. Woodruff, of Ellicottville, N. Y., has patented an improvement in the class of drag harrows that are rotated about the central pin or pivot as the harrow is drawn along.

An improved device to be attached to a corn planter for the purpose of planting or dropping corn at regular intervals, has been patented by Mr. Joel M. Shackelford, of Decatur, Ill. A beam is fixed rigidly across the front of the corn planter in front of the boxes, and has secured to it grooved rollers or pulleys for the support and guidance of the working rope, and fixed centrally upon the beam is a standard supporting a grooved driving wheel, around which the rope makes a turn as the planter is moved along. The rope being fastened at each end to a stake driven in the ground causes the driving wheel to revolve and operate the improved device.

Low Weaving Sheds.

It is claimed that the English method of building cotton mills but one story high is much more advantageous than the American method of placing floor above floor. In the low weaving shed with glass roofs used in England, an even and fine light falls on every loom; and the machinery, being placed on solid foundations, does not vibrate. Under our brighter skies it is doubtful whether glass roofs for skylighting would be of material advantage, and it is certain that they would not be comfortable for the operatives in midwinter or midsummer.

The question of vibration seems to be of more practical importance, especially if it is true, as our consul at Manchester says, that the most intelligent and competent mill managers in England have found it impossible for mills with looms on several floors to compete with those having the looms all on the ground.

Country Gains to Summer Visitors.

A newspaper correspondent moralizes over the closing season among the Catskills:

"One of the necessary preparations to the return home by all boarders is being weighed. Nearly every one expects to gain in weight, and nearly all do. The gain runs from two to ten pounds—averaging five pounds. For 50,000 people this would give the comfortable gross amount of 1,250 tons of fat added to New York and Brooklyn through Catskill sojourning. This is the net gain of the boarders—250,000 pounds of fat against $1,000,000, showing human adipose tissue to cost $4 per pound according to Greene and Ulster county rates. Many delightful homilies may be preached on this text—Fat $4 per pound."

We are inclined to think that the writer underestimates the quality and value of this increase of substance. Probably the most of it is not adipose tissue, but firm muscle and other tissues of vital importance in the human economy. A record of increase in strength through summer living among the hills would be worth having. The hotel keepers should provide lifting machines as well as scales.

New Style of Cotton Packing.

Reporting on a bale of cotton packed by the Cotton Economy Company, of New Haven, by the use of the Dederick hay press, Mr. Edward Atkinson, of Boston, says that it contained 105 pounds of cotton, pressed to the density of hard wood. It is claimed that such compression does not injure the fiber. The alleged advantages of this method of packing are the compactness of the bale, its easy handling, and the very small proportion of tare. The bale is bound with wire and protected by a light, cheap bag, which keeps the surface clean. A bale so pressed was soaked four days in a canal, the water penetrating less than half an inch.

Testimony of the Rocks.

From a small erratic block, wholly unlike the rock of Mount Washington, found on the summit of that mountain recently, Prof. C. H. Hitchcock infers that the glacial ice was deeper in that region than has hitherto been supposed. The bowlder resembles the rocks of Cherry Mountain; and if it was carried to Mount Washington by ice, as Prof. Hitchcock believes, Mount Washington must have been totally submerged by the ice sheet at some time during the glacial epoch.

Human Hair from China.

Among recent importations by a New York house dealing in Asiatic goods were ten cases of human hair from China, weighing in all 1,330 pounds. Chinese hair is dark and coarse, and is worth from 50 to 65 cents a pound. It is sold in bulk to the retail traders, who make it up into switches, puffs, frizzes, and other capillary adornments for the heads of female citizens of African descent.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

(1) G. S. H. asks: What size boiler and boat would I want for engine 2 inch bore by 4 inch stroke, and what speed could I get from same? A. Boat about 12 feet long and 3½ feet beam. Boiler (tubular) about 18 inches diameter and 3 feet 4 inches high. Speed probably about 5½ miles.

(2) C. G. G. writes: At the West the harvest mites (jiggers) are a torment to women and children and to some men. We cannot go into our garden even without the necessity of lathering all over with soap and changing every garment from collar to shoes. Formerly these could be worn the next day, but Dr. Tanner has made mischief here as well as among the tramps, and now they live on, on a growing appetite. I wish to ask is there not something which we can apply to the person to keep them from biting us, so that we can go to our garden more than once a day. We have tried quassia, salt, and alum without effect. The form of a dry powder would be best, as it would be applied on a cool morning when it would not be well in bath. A. Dalmatian insect powder, applied in small quantities with a suitable bellows, is said to have proved effectual in keeping the insects away. Of course it is not intended that clothes thus salted should be worn constantly. Frequent bathing is indispensable.

(3) S. B. writes: A small class are studying chemistry at this place, and are anxious to learn the cause of combustion. Will you please tell us through the SCIENTIFIC AMERICAN? Some say we apply a match to carbon to increase the motion of its molecules, in order to bring the molecules of oxygen sufficiently near to those of the carbon to enable the atoms to unite; then all that is necessary to determine chemical union is to give the molecules the right motion to get them sufficiently near each other for cohesion to appear and draw them together. Others say that motion has nothing to do with it, but the atoms must be separated by heat and then they will clash together regardless of their motions. A. Combustion is a chemical reaction comprehending the direct union of two or more substances. Heat accelerates molecular motion, and in effect brings the molecules within the range of chemical attraction. In chemical combination it is not the force of adhesion, but of *chemism*, which determines and effects the reaction. Consult Cooke's "The New Chemistry," and Tyndall's "Heat as a Mode of Motion."

(4) S. H. H. asks: 1. What is the best book on the uses and seasoning of the timber of this latitude? A. We do not know of any work specially devoted to this subject. You will find some information in Knight's Dictionary under "Wood," etc. 2. What is the best style of small saw mill to attach to an overshot wheel of twenty-five feet diameter and from six to twelve horse power? A. A circular saw mill. 3. Would not an overshot be the best wheel for a small and variable water supply with twenty-five to thirty feet fall? A. Yes.

(5) R. F. H. asks (1) if air is compressed into a smaller volume, what is the rule to find the increased pressure and temperature of said air? A. The pressure is inversely as the volumes. If 10 cubic feet air is compressed to 1 cubic foot the pressure is 10 atmospheres, the temperature remaining unchanged. 2. If while so compressed the temperature of said air is lowered by radiation, does the pressure decrease, and if so, by what rule? A. Yes; see tables of temperature and pressure in scientific works. You will find a great deal on the subject of compressed air in SUPPLEMENTS, Nos. 1, 2, 22, 24, 176, 177, 182.

(6) E. U. writes: In looking over several numbers of the SCIENTIFIC AMERICAN I find the question asked how to make pencil drawings permanent. You recommend alcoholic shellac varnish. The following is better, and no trouble; Steam the drawing over boiling water, both sides. It will do for crayons or pencil. I have a pencil drawing that I treated that way 18 to 20 years ago, and it has had rough usage, but there is no rub out to it.

(7) G. S. H. writes: I am desirous of building a small steam yacht, just large enough to carry two persons (safely), guns, ammunition, and a small tent—in all weighing about 400 lb. I wish to get the proportions of the engine, boiler, boat, and screw, and I wish them proportioned in such a way that I can get the greatest possible strength and speed. A. It is probable that you would be suited with a boat about 14 feet or 15 feet length, 4½ feet beam, and 2 feet depth, with engine 3 inch cylinder by 3 inch stroke. Upright tubular boiler 24 inches diameter by 4 feet high. Propeller 22 inches diameter and 33 inch to 36 inch pitch.

(8) G. E. F. asks: How is "dope" or harness blacking made? A. 1. Molasses, ½ lb.; lampblack, 1 oz.; yeast, a spoonful; sugar, olive oil, gum tragacanth, and isinglass, each 1 oz.; and a cow's gall. Mix with 2 pints stale beer, and let stand before the fire for an hour. 2. Molasses, 8 parts; lampblack, sweet oil, gum arabic, and isinglass, each 1; water, 32; apply heat. When cold add 1 oz. spirit of wine, and apply with a sponge. If too hard place the bottle in hot water before using. 3. Black resin, 2 oz.; melt in a glazed earthenware pot and add 3 oz. beeswax, ½ oz. fine lampblack, ¼ dr. Prussian blue in fine powder; stir well, take off the fire, and add sufficient oil of turpentine to form a thin paste. Apply with a piece of linen rag, and polish with a brush.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

T.—A fine silicious clay—useful in the manufacture of some kinds of pottery and for polishing purposes.

COMMUNICATIONS RECEIVED.

Curious Fact in Natural History. By F. C. H.
On Absolute Temperature. By C. M. B.
Talking by Telephone Through the Human Body. By F. E. K.
On Motion. By H. S. B.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

August 31, 1880,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1836, will be furnished from this office for one dollar. In ordering please state the number and date of the patent desired and remit to Munn & Co., 37 Park Row, New York city. We also furnish copies of patents granted prior to 1836; but at increased cost, as the specifications not being printed, must be copied by hand.

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Spoon and fork, L. F. Griswold 11,961

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Boot channelling machine, F. S. Potter, New Bedford, Mass.
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Electric signaling apparatus, J. V. Reed, New York City.
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Plans of the grounds and other necessary details may be had on application at the office of the Superintendent of the Exchange, or by addressing him to care of lock box N, New Orleans post office.

Each design to be accompanied by a clear and condensed written description of drawings and the proposed material of construction, under seal, and a sealed letter, giving address of the author, the name of the party offering the design not to appear on the drawings or to be attached to the description.

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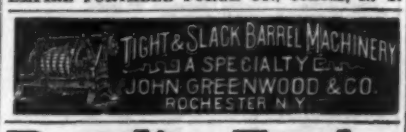

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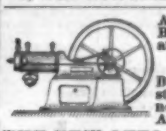

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